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ON

THE NATURE,

AND

Cure of Strabismus:

BY

OPERATION

BY

J. A. RATTON, ESQ. M. R. C. S. L.

AND L. A. C.

Madras Medical Service.

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PREFACE.

I was induced shortly after my arrival in India, seriously to turn my attention and direct that of the community of the Presidency to this operation, from having, while in conversation with W. R. Smyth Esq. casually noticed the circumstance that I had frequently operated for the same, while he at the same time favoured me with his remarks and views upon a case of Talipes Verus, on which he had operated with the most gratifying success. The notes of my two first cases, which I chanced to have by me, I did myself the pleasure of laying before him, and felt not a little surprised to learn, that he was not aware of any case of this operation having yet been performed in this Presidency, though it had been, as could be perceived by the periodicals, performed with eminent success by F. H. Brett Esq. of the Calcutta Eye Infirmary, as far back as last March.*

The liberality which Dr. Smyth has so kindly shewn in forwarding my views, both in the endeavour to procure suitable cases for a fair trial of the operation, as well as by ensuring success to my first cases by his able assistance, calls for my warmest thanks. I subsequently made such enquiry, as shewed plainly that neither the Press or the public were at all aware at the time of any such operation having been performed. This being the case, I viewed it as a duty

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* This Preface was put in type seven months past, and has only been delayed appearing before the public, owing to circumstances over which the author had not the least controul.

I owed, both to the community as well as to myself, to shew by a few illustrative cases, that such as laboured under this infirmity, might, by undergoing a simple and slight operation, be effectually relieved ; and I need scarcely say, that I was urged to this step by all to whom I made mention of the subject. I will only further add, that in the few cases I have performed in this Presidency, I have sought publicity, upon the trite adage, that " seing is believing ;" fully satisfied that, a due regard being observed as to the cases selected, not indiscriminately, but from judgement : allowing that the operation were conducted with a sufficiency of skill, it would itself be its best recommendation, to such as were present, and at the same time prevent any unpleasant reflections that might arise from an apparent desire of concealment.

My endeavour in the following pages has been by keeping the subject sufficiently simple, avoiding all *unnecessary* use of Medical terms, and, for the same reason, confining myself as much as possible to the mere statement of facts, to make it, with the aid of the accompanying plates, sufficiently intelligible to the general reader, to whom it may have the charm either of novelty or interest as the case may be—yet so as to render it not altogether devoid of interest to the more learned : having availed myself of the experience of such writers as bear more immediately upon the subject, and of Lizar's elegant and accurate delineations of the nervous distribution in the orbit. In connection with which, it will likewise be viewed in its true and relative position to the general pathology and physiology of the eye, and not as a mere division of muscular fibre, as some in disparagement of an operation which they but imperfectly understand, would feign have it supposed to be. It may now be viewed from a higher and more scientific station, as a branch, and an interesting one of Myotomy, or Tenotomy, subjects than which, there are perhaps few more interesting in the whole art of Surgery, or capable of producing more beautiful or beneficial effects.

"He" says Johnson "that endeavous after fame by writing, solicits the regard of a multitude fluctuating in pleasures or immersed in business, without time for intellectual amusements; he appeals to judges, prepossessed by passions, or corrupted by prejudices, which preclude their approbation of any new performance; some are too indolent to read anything till its reputation is established; others too envious to promote that fame which gives them pain by its increase. What is new is opposed, because most are unwilling to be taught; and what is known is rejected, because it is not sufficiently considered, that men more frequently require to be reminded than informed."

Johnson was a man of the world, and had moreover in his passage through it, rubbed off what little polish he naturally inherited: though doubtless when he wrote this satire upon society, he was labouring under a fit of the gout, to which he was a martyr. After all, I believe his true meaning is more clearly and elegantly expressed in the words of Horace "*Invidus alterius macrescit rebus opimis*" in the following pages I have purposed merely to shew by a brief statement of such facts and cases, as my own experience has more immediately pointed to my notice: the ease and benefit with which a simple operation, may be applied to the relief of many of our suffering fellow creatures; aware that "He who waits for an opportunity to do much at once, may breathe out his life in idle wishes, and regret, in the last hour, his useless intentions and barren zeal."

I will only add, that If it prove of service to the community by drawing attention to the subject of the operation itself more particularly, and likewise to the corresponding and general principles of Orthopœdic Surgery, of which this is only one of its many interesting branches: whether the operation be peformed by myself, or others who may be induced to turn their attention more immediately to it, it will have answered the purpose contemplated: and I shall rest satisfied with having thus fulfilled a duty, which it is said, every one owes to his profession.

PART I.

Strabismus, the term under which that affection of the eyes usually called squinting is now commonly known, used, seldom to come under the notice of the Surgeon, as in the majority of cases, it was held to be beyond the reach of art; but since experience has shewn that it can be remedied by a comparatively simple operation, numbers have eagerly availed themselves of the opportunity it offers of relieving them from so unpleasant an annoyance.—The eminent success which has followed tenotomy in the cure of club-foot, has of course induced Surgeons to carry out the same principles and the same operation in the treatment of analogous contractions and distortions; and we may almost say, that there is hardly a joint in the human body for which, if contracted, tenotomy or myotomy has not been performed within the last few years; such as wryneck, the varieties of club-foot, contraction of the hamstring muscles, 'et id genus omnia.' No doubt many muscles and tendons have been unnecessarily divided and without success, and perhaps many more will be; yet it is certain that a large number of contractions have been relieved, which, hitherto, had been considered incurable; and amongst which, we may number that giving rise to the deformity of squinting.

Much has already, and, in all probability, much more will yet be written upon this simple operation, both from the real benefit and great interest felt and shewn in it by the public, as from its late novelty to the profession; inducing such as are conversant with, to make it sufficiently plain and intelligible to all classes, so as to take from it that appearance of mystery and dread, which universally attaches itself to any new and imperfectly understood operation, concerning, especially, so delicate and extremely sensible an organ as the eye and its appendages, are generally supposed to be; and more especially the latter; but which, the facts alone of this operation prove, that during their healthy though deformed state, such indeed is not the case, for, truly speaking, it is the surprise of all operators, how much the eye will, under these circumstances, bear with impunity, and how little pain is experienced.

There is also a fashion for every thing, just so, there must be a fashionable way for performing this operation, each performer, perhaps naturally enough, seeking through the press, to eulogize, and shew forth the particular merits of his own; shewn in a preference for using, either a pair of scissors, or a knife; a blunt hook or a sharp one; or some other little niceties in the shape of instruments, or manipulation of the operation, best known and valued by themselves, and consequently, for a knowledge of which the public is indebted to their deep, not to say *interested* anxiety for their benefit.

However, my object is not to enter into the ramifications into which this operation has been traced, or attach undue importance to it; nor do I seek to enter into the comparative merits of who first thought of, proposed, dissected for, or operated on, either the dead or the living body. That, I will leave for those who may consider it of sufficient interest, either to relieve the eye or the mind of the patient, or as an innocent pastime for their own leisure hours ; contenting myself with a mere statement of facts as they are generally received, seeking rather, to draw the attention of those suffering from this unpleasant annoyance, to the principle, and manner of being relieved, by submitting to undergo a little pain for a short time, with a certainty of success, at least, in such cases as are remediable by these means, and which only a conscientious practitioner would undertake, were not even his own reputation at stake. This, has induced me to add another item upon the subject, more especially as I perceive, that the elder sister presidency has, in this respect, derived the advantages resulting from the experience of Mr. F. H. Brett, Superintendant of the Eye Infirmary, and which as yet has not been introduced to the notice of the community of this Presidency. The performance of the first successful case, with a few others equally so, now affords me that opportunity, having from both frequently assisting in and operating for it in England, been enabled to make myself practically acquainted with its particular merits.

This simple though delicate operation, which has lately become so well known, and met with such attention on the continent, and subsequently in England, was first actually performed and brought into notice, by the celebrated professor, Dieffenbach of Berlin, towards the end of the year 1839, and mention of which first appeared in England in the British and foreign Medical Review for April 1840, p. 558.

Though, all agree in ascribing the merit of its first proposition to M. Stromeyer of Hanover, who, as his work on the cure of deformities shews, first directed attention to it in 1838. This, however, has been disputed by M. Jules Guerin, and M. Carron du Villards, who, from having both experimented on the subject in the same year, each individually claims the merit to himself. M. Gensoul ex-surgeon-in-chief of the Hotel Dieu of Lyons, having, to believe the Annals d'Oculist published in the Bulletin de Thèrapeutique for August 1840, suggested the practice of myotomy in a case of squinting, five years ago.

We cannot however much wonder at this at the out-set of an operation, when we even find the fact of bringing it into notice, competed in other parts.

The first case performed by Dieffenbach as detailed in the Medicinische Zeitung, Nov. 1839, is indeed a formidable affair, contrasted with the present simplified and improved mode of conducting the same; seeing that he used four hooks, and required three assistants: though, we must not forget that he had to contend with the difficulties and responsibility of a first operation, in which the worthy Professor acquitted himself so successfully; and, as it may from being the first operator of the kind performed on the eye, prove interesting to those who have not had an opportunity of being acquainted with it, I have here taken the liberty of transcribing.

Case I.—The subject of this operation was a child seven years old, whose eye was drawn far into the inner angle of the eyelids, so as to produce considerable disfigurement. The operation was performed in the following manner. The head of the child was held against the chest of one assistant, while another, with two hooks, kept the eyelids widely apart. The operator then passed a third hook, which he gave to a third assistant to hold, through the conjunctiva, (delicate living membrane of the eye) and to some depth in the subjacent cellular tissue at the internal canthus (inner angle). He next forced a fine double hook in the sclerotica (white of the eye) at the inner angle, and taking it in his left hand drew the eye outwards. Then, cutting into the conjunctiva close to the ball where it is continued from it to the internal canthus, and penetrating more deeply by seperating the cellular tissue by the side of the sclerotica, he divided the internal rectus muscle (inner straight muscle), close to its insertion, with a pair of fine scissors. The eye was immediately drawn outwards by the external rectus, as if it had received an electric shock; and in another instant became straight, so that there was no difference perceptible between its direction and that of the other eye.

The hæmorrhage during the operation was but slight, though sufficient to impede it. The after-treatment consisted of cold lotions; no inflamation ensued, and within eight days the cure was completed.

To Mr. P. Bennett Lucas is justly due the merit of having first brought it forward in England, as we learn from 3 cases published by him in the Lancets, for April 18, 1840, P. 135, and May 2, P. 189; even here a Dr. Franz (formerly a pupil of Dieffenbach and from that claiming it perhaps intuitively) has sought to dispute the point. "Qui palmam meruit ferat" these cases I now give, as extracted from the above named periodical, considering them sufficiently deserving of notice, not only frombeing the first, but also from the interesting character of the cases themselves—for it will be perceived that two were upon children respectively of 5 and 6 years of age, which proved successful, while the third, upon an old woman of sixty, who had squinted from childhood, it was unattended with any benefit.

Case 1.—Mary Ann Daly, aged 6, was born with her eyes perfectly straight. After the measles she suffered much from repeated attacks of stremous ophthalmia; on being cured of which, it was found that her right eye was permanently turned deeply into the inner canthus, with also a slight degree of obliquity upwards. The strabismus has existed for three years. When the unaffected eye is closed, the turned-in one endeavours to right itself, and the child, by an effort, can direct it as far as the centre of the orbital axis, but it speedily returns to its abnormal condition. The child is powerfully strong, of very full habit, and of a strumous diathesis.

April 11th 1840. In the presence, and with the kind assistance of Mr. Fitzmaurice, Mr. Wardrop, jun. and Mr. Alexander, I proceeded to perform the operation for the division of the internal rectus muscle, in the following manner. The child was received in the lap of one assistant, and her head allowed to rest on his right arm and chest, by which it was partially secured. The eyelids were kept apart by Mr. Fitzmaurice, and the struggles were prevented as much as possible. With a forceps and an artificial pupil knife, I easily divided the conjunctiva from below upwards, about three lines distant from the cornea (horny part of the eye), and thus exposed the sclerotic coat. The edges of the incision almost immediately became swollen, from the effusion of blood and tears into the connecting reticular tissue, forming a partial chemosis. Very slight hæmorrhage took place from the divided vessels of the conjunctiva, which was checked by the application of cold water. Upon the eye being again exposed, the incision was readily recognized, and introducing a small blunt probe between its edges, I separated the reticular tissue, connecting the inner portion of the conjunctiva to a sufficient extent, to enable me to reach the insertion of the inner rectus. I then introduced a bent probe, and directing it from below upwards, had little difficulty in inserting it between the tendon of the muscle as it approached its insertion, and the sclerotic coat. Thus, having the muscle on the probe at my command, I allowed the eye to rest for a moment or two, and then carefully and gently drawing the tendon towards the incision of the conjunctiva, I divided it with a pair of common scissors, and withdrew the probe.

The eye soon resumed its normal position, and the axes of both harmoniously corresponded. On the division of the muscle the eye was not *forcibly* drawn outwards, it gradually returned to its place. The lids were now allowed to remain closed ; a layer of lint, dipped in cold water, was placed over them, the following powder was given, and the child soon after fell asleep :

Calomel, 2 grs ; James's powder, 3 grs.

12th. Both eyes are perfectly straight, and follow each other's movements with regularity. The child's bowels have been moved three times, and in all respects she is free from fever and excitement.

I have performed this operation in two other cases, without any material deviation. One in a child five years old, was equally successful. In the other, that of an old woman of sixty, it was unattended with benefit to the Strabismus, which was of fifty-seven years' standing.

The operation in the other case, that of Mr. Crossland, is related by Mr. Bennet Lucas, as follows.

In the presence, and with the assistance of Dr. Carroll, Mr. Toogood Downing, Mr. Wardrop, jun., and Mr. H. Downing, I performed the following operation :—A bandage was applied to the sound eye to exclude the light, and the patient was seated on a low-backed chair before the window, and his head reclined against Mr. Downing's chest, who also supported the upper eyelid, by means of the wire speculum. Mr. Wardrop jun., depressed the lower lid. The patient, who possessed great moral strength, everted the turned in eye to his utmost, and with the greatest facility I introduced a small, fine pointed hook into the inner conjunctiva, about three lines distance from the cornea, and, with a very fine straight knife, I divided this membrane, from below upwards, to the extent of half an inch, leaving the hook still attached to the inner segment of the incision. I next separated the divided inner portion of the conjunctiva from the subjacent sclerotic coat, by means of a blunt probe, and having introduced between the lips of the incision the bent probe, I passed it underneath the tendon of the internal rectus muscle. The hook was now withdrawn, and the operation was suspended for a moment. I next raised the tendon by means of the bent probe, towards the incision of the conjunctiva, so as completely to bring it into view, and, with a curved scissors divided it. The eye immediately resumed its natural position. The hæmorrhage did not amount to as much as two drops, and the operation was completed in a minute and a half.

Calomel 2 grs. James's powder, 3 grs. a saline draught in the morning.

22nd. The inner conjunctiva is slightly ecchymosed; the eye is perfectly straight. Mr. Crossland had a good night.

24th. Ecchymosis of conjunctiva is disappearing. The state of the patient is most satisfactory.

26th. The patient is in every respect going on well; he suffers no pain in the eye; the inner conjunctiva is still reddened, and a layer of lymph exists for the purpose of reparation; which is going on beautifully, as the patient was not aware of its existence until he saw it by means of a glass. He goes to business to-morrow.

Mr. Bennet concludes his interesting papers by the following observations.

"As will be observed, on the perusal of the foregoing cases, and of those which have appeared in the Lancet of April 18th, the operation for the cure of Strabismus, which I have now successfully employed in five cases, differs in many, and I would say essential, particulars, from that adopted by Professor Dieffenbach—indeed, when I first attentively considered the detail of the three cases as reported in the British and Foreign Medical Review, I was struck with the number of hooks, which were employed, and the necessity arising therefrom, for many assistants, who in all operations, but especially in operations upon the eye, too often interfere with each other, and with the operator.

In Professor Dieffenbach's operation, no less than four hooks are employed, and one of these a double one ; two for the purpose of keeping the eyelids apart, a third is passed into the conjunctiva, and the fourth, the double one, is fixed into the sclerotica. In none of the cases, with the exception of Catharine Cuthberts, did I use more than one hook, and in the case of the child, Mary Anne Daly, I used none, having divided the conjunctiva with a knife and forceps. This latter instrument I have since found is not, for many reasons, to be depended upon as much as the hook ; it gives more uneasiness to the patient, and is apt to lose its hold of the conjunctiva, which the hook never does until it is intentionally removed." (See Mr. P. P. Lucas's " remarks on the abandonment of the Sharp hook" Lancet, August 8th 1840.)

To Mr. Lucas we are indebted for the operation under this simplified form, which he first introduced, and under which it has with the exception of a few trivial, not to say childish alterations of hooks, knives, or specula, (according to the crotchets of operators, or the desire of having some new instrument connected with their name,)* continued much the

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Lancet April 3, 1841.

* It is astonishing, seeing that the aphorism of the celebrated Desault ; "the simplicity of an operation is the measure of its perfection," originated in the mind of one of our Gallic neighbours, to remark the " fureur" in the instruments that can only serve to complicate a simple procedure, which they exhibit. We have had occasion to blush for the finicking modifications of our countrymen, in the production of so called new instruments ; but it is somewhat refreshing

same ;—I at least am free to own, that I still persist in operating much in the same way as he recommended in his first cases, (and still successfully practises,) with I believe the simple variation of using the scissors only, and to this I am led after having had a sufficient experience with both, to induce me to give it the preference ; it is I conceive the simplest, and more to be depended on when used in the manner recommended, and relieves the patient's mind from much of the alarm created by the name, not to say the handling, of a knife, however sharp or delicately small it may be : after all, I believe it is more a matter of taste than of judgment strictly, for either will probably do equally well. I may however here be allowed to state, that I have both taken great interest in, and watched the progress of this operation, from its infancy ; have made myself acquainted with the particulars of each operation, mode of proceeding, and instruments employed as they appeared, and now have convinced myself that the present mode of proceeding is as good as any recommended, if not strictly speaking, both the simplest and the best.

Previous however to entering too fully upon the subject, or attempting a description of the operation itself, it may not be irrelavent to illustrate such parts of the anatomy of the eye, as are more immediately the seat of and connected with the operation, so as to

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to see that our Parisian friends have carried away the palm of absurdity most triumphantly. Will our readers believe that a fancy instrument maker of Paris, M. Charriere, advertises no less than forty-nine different instruments for rectifying squinting. Forty-nine improved aids for the bungler : among them some are especially amusing ; for instance, Spatula of M. Dieffenbach ; conjunctival dissector of M. Guerin ; hooked forceps, for raising a fold of conjunctiva, of M Leroy d'Etiolles, &c. &c.

render it sufficiently intelligible to the non-medical portion of the public, who otherwise might find an apparent confusion of technical terms where only they sought for and expected to find simplicity of style and clearness of exposition.

Each orbit of the eye is formed, as shewn (Plate 1 Fig 1) by seven bones ; surrounded by cellular membrane, fat, and imbedded in which as upon a cushion, rests the ball of the eye with its muscles and appendages. The ball of the eye is moved by six muscles, (Plate 2 Fig 1) four straight and two oblique, the four straight muscles N. S. E. W. being placed at right angles to each other, forming as it were the cardinal points to the centre of the eye or pupil ; the two oblique muscles, tending, the one (m) to turn the eye upwards and inwards, the other (e) downwards and outwards ; and, according to some, when acting together, to bring forward, or slightly protrude the eye ; the four straight muscles, when singly or alternately contracting, draw the eye in its particular direction : when all contract together, according to the same writers, they draw the eye inwards : but this latter action (as they say,) when opposed, (as in the natural subject it is,) by the two oblique muscles, the eye becomes fixed and stationary in the centre. This however, is denied by others—the oblique evidently differ from the straight muscles in every respect, both as regards number and size as well as direction ; yet it is a received opinion, that they antagonize the straight muscles, and so between them keep the eyes suspended ; however this is not proved by analogy, for where, as in brutes, a powerful retractor muscle is bestowed in addition to the straight muscles, the oblique muscles have no additional magnitude given to them; in fact, we cannot, even if desirous, by the united action of the straight muscles, retract the eye, as we see qaudrupeds draw in their eyes, which is an argument against these muscles being retractors, and therefore against the oblique being their opponents, to draw it forward; for neither can we by any effort of the will cause them to protrude, or advance in the slighest degree.

"By dissection and experiment" says Sir C. Bell "it can be proved, that the oblique muscles are antagonist to each other, and that they roll the eye in opposite directions, the superior oblique directing the pupil downwards and outwards, and the inferior oblique directing it upwards and inwards. But it is proved, that any two of the recti muscles are equal to the direction of the pupil in the diagonal between them; and there is no reason why an additional muscle should be given, to direct the pupil upwards and inwards more than upwards and outwards, or downward and inwards. It is evident, then, that the oblique muscles are not for assisting the recti in directing the eye to objects, but that they must have some other appropriate office."

"In the greater number of muscles the same principle directs the arrangement of the fibres; they exchange power for velocity of movement by their obliquity; they do not go direct from origin to insertion but obliquely, from tendon to tendon." (Sir C. Bell vol. 1 p. 257.)

And experience proves them to be the involuntary, or, if we may so term them, the guardian muscles of the eye—thus, what by their direction, they lose in strength, they gain in celerity of movement, which is of infinite more consequence, viewing them in relation to the office for which they are intended.*

Understanding this, it will be easy to see, how a section of either of the horizontal straight muscles (e or w) will allow its antagonist to draw it towards itself: in the section then of one of these two muscles consists the principle of the operation for the relief of either the simple, convergent, or divergent squint; and upon the comparative action of the antagonist muscle depends its ultimate success. Being now sufficiently acquainted with the orbit, and the relative position and action of its muscles, it may be perhaps as well, before proceeding to see a little into the influence which affects, and causes these muscles to act in direction to the will, and occasionally independent of and in opposition to it, as shewn in the cases under present consideration: and to understand which, we must in the first instance notice what the nature of a muscle itself is—A muscle then is fibrous, that is, it consists of minute threads bundled together, the extremities of which unite to form a tendon. Innumerable fibres are thus joined together to form one muscle, and every muscle is a distinct organ. Of these distinct muscles for the motions of the body, there are not less than 436 in the human frame, independent of those which perform the internal vital motions. The contractile power, which is in the living muscular fibre, presents appearances which, though familiar, are really the most surprising of all the properties of life. Many attempts have been made to explain this property, sometimes by chemical experiments,sometimes on mechanical principles,but always, as might be expected, without any satisfactory result. We must be satisfied with saying, that it is an endowment, the cause of which it would be as vain to investigate as to search after the seat of the mind, the soul, or such other faculties as are given to us to use, but whose essence or being, is only known to the Almighty.—But, the ignorance of the cause of muscular contraction does not prevent us from studying the laws which regulate it.

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* The German School, however, have adopted a different view of the case, as we learn more particularly from the writings of A. W. Volkmann and Professor Hueck of Dorpat, who consider—that the office of the oblique muscles is to turn the eye upon its axis, so as to render it possible for the rays of light from any object to fall on identical spots on the retinæ, even when the head is inclined downwards; a condition on which, as is well known, singleness of vision depends (Müller's Archiv, 1840, Heft, iv. p.480. Med. Review 1841.)

We have seen, that there are seven muscles attached to the eye ; it is now necessary to explain how they are associated to effect that combination, which conduces to the harmony of its different motions, and to the perfection of vision. In the first place, the million of fibres which constitute a single muscle, are connected by a tissue of nerves, which produce a union or sympathy amongst them, so that one impulse causes a simultaneous effort of all the fibres attached to the same tendon. It is by this beautifully simple arrangement, that, (in the limbs especially seen) the lever being lengthened or shortened, is carried beyond the sphere of action of one class of muscles and enters the sphere of activity of others; and this adaptation of the organs of motion is finely adjusted to the mechanism of the organ; in short, whether we contemplate the million of fibres which constitute one muscle, or the different muscles which combine to the movement of the whole, nothing is more surprising and admirable than the adjustment of their power, so as to balance the mechanical resistance, arising from the change in the position of the levers.

In the animal body, there is a perfect relation preserved betwixt the parts of the same organ:—the muscular fibres forming, what is termed the belly of the muscle, and the tendon, through which the muscle pulls, are two parts of one organ; and the condition of the tendon indicates the state of the muscle.

Having thus understood that the muscles are distinct organs of motion, we perceive that they must be classed and associated, in order that many shall combine in one act; and that others, their opponents, shall be put in a state to relax, and offer no opposition to those which are active. These relations can only be established through *nerves*, which are the organs of communication with the brain, or sensorium. The nerves convey the will to the muscles, and at the same time they class and arrange them so, as to make them consent to the motions of the body and limbs; and this brings us to the nerves themselves. Now, with regard to entering minutely into the distribution of nervous power in the orbit, I think this is scarcely either required, or called for in these pages; to the profession it is unnecessary, and for the general reader, it would I fear, only tend to confuse instead of enlightening him on the subject : it will however perhaps, be as well to mention in a general manner, and attempt to describe with the aid of the accompanying plates, that, of the four straight muscles above spoken, the superior, inferior, and internal, are supplied and connected together by the same nervous twig, where they are beautifully seen in Plate iv. marked 3 Fig. 4 and 5being branches from the 3rd and 5th pair of nerves arising from the brain ; which nerves also supply and connect them with the inferior oblique muscle, as seen more clearly in Fig. 5 and of the remaining 2 muscles of which we have spoken, the superior oblique is supplied by a distinct nerve (the fourth) as well as by an ophthalmic branch of the 5th, which is seen marked (n) in Fig. 4 ; while the remaining or external straight muscle is supplied by another, different, and distinct nerve, called the 6th, also arising from the brain, (corpora pyramidalia) and very clearly and distinctly seen in the accompanying dissection numbered 6 in the same Plate. Having understood so far, the anatomy of the orbit, (which is as much as we shall require,) we may just take a passing view of the orbit as it appears "in statu quo" upon removing the scull-cap, when seen from above, (Plates 4 and 5) with its muscles, nerves, and arteries, in their relative positions ; and also in figure 2 where three of the orbiter muscles are bisected and in part removed, leaving the remaining parts in their natural position ; the removed muscles being, the muscle that belongs to and raises the upper eyelid, (A.Fig. 1,2 and 3), the upper straight muscle (B,) and the Pulley or superior oblique muscle marked C.

Now, though this operation does not actually call for a knowledge of the anatomy contained in this Plate, still, to a certain extent, it may be interesting, while on the subject, to have a partial insight into the animal mechanism which regulates and moves the upper eyelids; for here, in cases where the eye is kept permanently too open, from a congenital shortness, or a subsequent shrinking or atrophy of the muscle, it might become a question, as to whether a partial division of the muscle here shewn (Fig. 1,2,3, Plate 3) marked A. could be of service, without causing a drooping or inability to raise the lid, either of which perhaps could scarcely be called an improvement—though the drooping of the lids has, by some, been considered as a mark of beauty, and the same by many has even been said of Squinting—however this is mere matter of taste—and to those differing in opinion, it is a satisfaction to know, that both may in most cases be relieved if not cured.* It is I think generally admitted, that the native belles of this country consider a squint, if not a point of attraction is a mark of great good fortune not to be rashly interfered with, though the Beaux do not quite so much admire the "Prophets mark" in their eyes, as on their horses; after all, who can say where taste begins or where it ends, when, with the exception of lovers, no two persons are perhaps agreed upon the point—Black and white—The Governor's Band and Tom Toms, though sufficiently opposed, each, equally contends for superiority.

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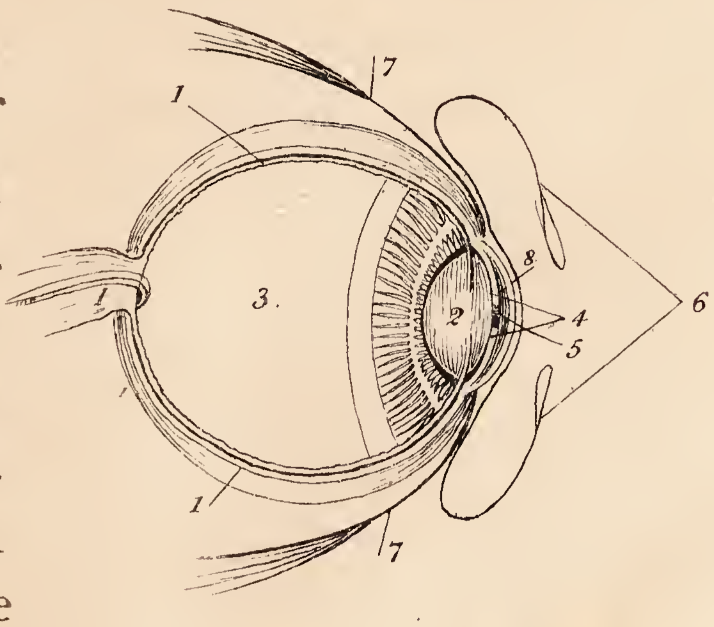
* We are apt until we be deprived of them, not to reflect on many actions of our frame, which, though apparently trivial, and performed without any direct cognizance of the will, are in themselves most admirable; minister continually to our necessities, and perfect the exercise of our organs: "with much compassion," says Paley in his Natural Theology, "as well as astonishment at the goodness of our loving creator, have I considered the sad state of a certain gentleman, who, as to the rest, was in pretty good health, but only wanted the use of these two little muscles that serve to lift up the eyelids, and so had almost lost the use of his sight; being forced, as long as this defect lasted, to shove up his eyelids with his own hands! Paley's Natural Theology.

(A simple and slight operation would however in this case have afforded effectual relief.—Ed.)

Now, though we have said sufficient upon the anatomy of the orbit and the appendages of the eye, readily to understand the operation, still, without taking a peep at the structure of the eye itself, and the membrane immediately covering its surface (which is indeed the first subject of this operation), we shall scarcely be enabled to reason correctly upon the probable effects upon vision to be expected, from the division of any particular sets of muscular fibre—and the organ of vision is now considered a subject of such general interest, that every man of education studies it.



" The function of the eye is not simply to transmit the rays of light to the expanded optic nerve (1 marginal plate): it collects the rays and presents them in a small compass, the impression being stronger or more intense from the concentration of the rays. It is the first principle of the constitution of the eye, that the rays of light must be so concentrated as to impinge strongly on the expanded nerve or retina on the bottom of the eye. Now, this is effected in the human eye by what is termed the crystalline humour, (2) shaped as alens (a double convex glass) and is necessary to concentrate the rays of light proceeding from an object, so as to form a small and lively image of it, (as in the marginal plate No. 1. 3d part) hence it becomes an essential part of the eye,by bringing the rays of light to a focus, and further,that the lens may make the rays proceeding from an object, converge into an accurate focus, so as to form a distinct image in the eye, a body termed the vitreous humor (3) (which gives shape and consistency to the eye) is interposed betwixt the lens and the surface of the retina. Again, it is necessary to the constitution of the eye, that, in order to increase the sphere of vision, the anterior part of it shall project and form a large segment of a small circle, so as to take a greater circumference into the sphere of vision than could have been done, had the larger sphere of the eye-ball been continued on the fore part. Another necessary part of the apparatus of the eye is the iris, (4) which is a curtain in the anterior chamber of the eye, perforated with a hole, which is capable of being enlarged or diminished, so as to admit a larger or smaller stream of light, according to the intensity of the light. In this provision we see the necessity of the anterior humor of the eye, (5) also for its being different from the others, that the iris may float in it. It is in fact a perfect fluid, a mere aqueous secretion, (about four or five drops,) while the others possess a degree of firmness : thus the iris or curtain of the eye is permitted to move with perfect freedom in it. It is also plainly necessary that the eye should be loose in the socket ; but that in its rolling motion it should still be attached ; and that, although the delicate anterior surface must be exposed, the internal parts of the socket should be defended from the intrusion of extraneous bodies. This is accomplished by the tunica conjunctiva.

The *conjunctiva*, or as sometimes called, the *Tunica Adnata*, (6) is the inflection of the common skin of the eyelids. It goes a little back into the orbit, and is again reflected, so as to come forward and cover the fore part of the eye-ball. Here it is pellucid, and the white coat of the eye shines through it. It covers the cornea also ; and here it is perfectly transparent, loses its character of vascularity, and is assimilated to the nature of the cornea.(8) As this coat is a continuation of the common integuments, it is, like them, vascular and liable to inflammation.

Where the conjunctiva covers the anterior part of the eye. the white sclerotic coat, or properly speaking perhaps, the thin tendenous coat, (7) formed by the insertion of the four straight muscles, which expand over the anterior part of the eye, is seen under it ; and, in consequence of this the tunical conjunctiva is sometimes called tunica albuginea. See Fig. 1, P. 2.

Having now taken a general but superficial view of the structure and functions of the eye, we may be better able to judge both of the effects and of the comparative merits of the operation, as well as of the varieties of the affection itself, to which it is most applicable.

Under the general term of Strabismus, there are described more particularly four varieties of this affection. Thus, the eye may be drawn inwards, (Strabismus Convergens) or outwards, (Strabismus Divergens) or upwards, (Sursum Vergens,) or the axis of one eye may be directed upwards and that of the other downwards, (Deorsum Vergens or Strabismus Horrendus); and these occur in frequency as they are here relatively named. The first, with its varieties, most frequently, and the last happily, is of very rare occurrence.

Again, distinct from these various forms of *Strabismus* is ***Luscitas***, or a permanent stationary squint of one eye—both are equally characterized by a loss of the natural correspondence of the optic axes; but in the former this is owing to a want of harmony in the motions of the two eyes, whilst in the latter it is owing to the eye being fixed, more or less immoveably in one direction. In pure Strabismus there is not a loss of motive power, but the distorted eye becomes straight, and is capable of being directed to any object when the other is closed. In Luscitas, on the contrary, the affected eye cannot, under any circumstances, be turned right; hence to this latter affection may perhaps more properly be applied, the term of "the club-foot of the eye," for to Strabismus itself viewed under all its varieties (with a few exceptions) it can scarcely be said to bear much analogy; for as we have seen, it is rarely owing to a permanent muscular contraction; but would appear to be dependant solely upon a physiological action of, or a habit of contraction in certain muscles, an opinion which is confirmed by the instantaneous return of the eye to its proper situation and movements, in most cases, as soon as the sound eye is covered. From this it would result, that, although it was the success of tenotomy in the contraction of limbs, which led M. Stromeyer to propose, and Dieffenbach to perform the section of a muscle of the eye in Strabismus, there is no analogy in the two cases; since the effect of the operation in Strabismus would not consist simply in the destruction of a physical resistance, but rather in the modification of a physiological action, and in the establishment of harmony in the muscular contraction of the right and left sides.

Strabismus may be either single or double, affecting one eye or both, or mixed, (alternating) affecting both indifferently but only shewing itself in one at a time.

It is single, when both eyes move independently of each other, each having a separate axis—the sight being double when looking straight forward, shewing itself in one eye only, the patient being forced to carry his head in a particular direction to obtain correct vision, and from which, he acquires by habit a peculiar carriage,

It is double when both eyes are affected, move together in unison, the pupils being relatively in the same position, and their axes being the same, whether divergent or convergent—in the former near objects appear double, far objects single; In the latter this is just reversed. (See Marginal plate No. 1 and 2, 3d part.)

It is mixed when affecting both eyes indifferently, but only shewing itself in one at a time, a preference being more frequently given to the one than the other—the temporarily unaffected eye appearing perfectly straight—in these cases when either eye is closed the other *always* appears straight, and natural in its movements ; but on suddenly raising the lid, the pupil of the closed eye is *always* found turned inwards or outwards, as the character of the squint may be.

Again, we do not find the affected eye always turned either directly inwards, outwards, upwards, or downwards, but inclined angularly in the intermediate directions, looking either inwards and upwards, or outwards and upwards.

The eye affected is very generally the weaker of the two, the left eye is also of the two the more prone to squint. On the other hand, we meet with a variety of the mixed squint, in which the sight of the eyes is equally distinct, and where consequently they are made use of alternately ; the operation on one eye *may* here prove sufficient by restoring the parallelism of the two eyes, but these cases are rare—a preference must of course be given to that of the inverted or less clear-seeing one ; the mutual convergens being here also shared by both eyes, and differs only in a lesser degree from those. necessitating a priori, the division of both.

Again, in some cases of alternating Strabismus, the patient has the power, immediately and voluntarily, to direct either eye properly ; but while this is done the other falls into the state of inversion.

In other cases, the habitually squinting eye becomes straight, and the opposite eye squints without the will of the patient, and while both eyes are open, there is power to direct properly one eye only-

The image seen by the properly-directed-eye appears clearer than the other, which is owing not only to that eye being the stronger, but especially to the circumstance, that in it, the impression is made on the central part of the retina, which is more sensible than any other ; besides, that the adjustment of the properly-directed eye corresponds with the distance of the object looked at.

The causes of Strabismus as described by authors* are even more opposite than the varieties of the affection itself, and certainly sufficient are enumerated to gratify the most fastidious—but which may very properly be classed for the sake of brevity under the four following heads : Congenital, Accidental, diseases of infancy, and a habit of looking fixedly at objects in any given direction ; nor, am I going to enter into a statement of their comparative frequency of occurrence, but shall merely state that the number which are simply congenital, or occur at so early an age as to be considered such by the patients themselves, have been in my own practice proportionally more numerous than appears to have been generally estimated.

However, not to waste too many words over either the varieties or the causes of this affection, let us at once proceed to the consideration of the two first described forms, under which we most commonly meet with it, and the operations for which only at the present require our notice viz. The Strabismus convergens (inner squint), with its varieties ; requiring for its removal, the division of the inner straight muscle of one or both eyes, according to its character : whether *single*, *double*, or *mixed* (alternating); and the Strabismus divergens (outer squint), requiring in like manner for its removal the division of the outer straight muscle of one or both eyes, according to its character ; either single, double, or mixed. Having so far simplified the heterogeneous variety of squints introduced to public notice by some writers, and which I fancy but few, two years ago so much as dreamt of being in existence, unless indeed as might happen, they were first the means of producing them, we may proceed more immediately to the consideration of its performance.

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* Occasioned by blows, (Smiths optics) continued pain in the head, (Buffon) fright, immitation, (continental Writers) and amongst late writers see Hall. Lucas,Elliot. Von. Ammon, Philip—Melchior. &c. &c.

The operation does certainly in some cases call for both judgment and nicety, and therefore is not the "simple thing" spoken of by some ; but like every other operation requires a certain degree of pre-consideration, and, not to be heedlessly proceeded with. The principal requisites for its successful performance are to a certain degree, tact and experience, to ascertain in the first place, which cases really do, or do not, admit of a perfect cure by operation ; of such as admit of palliation only, or lastly, of such, as from some organic defect in the cerebral functions, arising from a variety of causes, do not admit of either palliation, or cure ; and, of these last, I regret to say, there are some easier said to be immediately understood, than experience has proved to be so ; and which, by promising impossibilities has been of material disadvantage under the hands of eager experimenters, by bringing this operation, beautifully simple in itself, into discredit ; necessarily giving rise to those unsuccessful cases which otherwise would scarcely have been heard of;* a certain degree of judgement, is, therefore necessary; celerity and dexterity can always be acquired by practice.

PART II.

The few following cases which I have lately performed, will, I think, sufficiently shew the rationale and mode of proceeding in the operation for those two distinct forms, of which we have above spoken.—I will also take occasion to mention the particulars of the first case I operated on in England, both from its gratifying results, as from the circumstances under which it took place, the notes of which, it having been my first case, (though performed more than a twelvemonth ago) it so happened I had kept by me; which, having casually shewn to Dr. Smyth as noticed in the preface, led to my more immediately following up the subject in this Presidency, where it was apparently unknown.

I may here say a word or two about the value of introducing the detail of cases in discussions on professional subjects: that unless reasoned upon, and made the basis of inductions, such dry matters of fact tend to weary rather than to enlighten the mind. But all reasoning, to be of the slightest value, should be based on practical facts; and hence cases are invaluable in proof of doctrines and treatment. The direction of treatment must be guided by a sound diagnosis, and from the deduction of practical rules, the result of experience. Cases are direct proofs of symptomatology, and frequently of departures from received rules: hence practical deductions should be founded on cases, and facts should accumulate before anything be taken for granted.

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* "Mr. Duffin (at p. 51) mentions that a girl was shewn to him who had been operated upon, and whose eyes afterwatds turned spasmodically in every possible direction.—On enquiry it appeared that she had suffered from chorea, and that the squint (which was intermittent) was a sequela of that disorder." Was this a proper case to be operated on? How many of these unsuccessful cases may there not be in like manner attributable to their unfitness for the operation?—Ed.

CASE 1st October 5th 1841. This was a case of the single divergent or outer squint (Strabismus divergens) of the left eye, occurring in the person of a native maty boy (in my service), eighteen years of age, named Veerasawmy; and requiring for its cure, the division of the outer straight muscle of the eye (rectus externus;) the boy squinted from birth: when desired to look straight at any given object, he saw it only with one (the right) eye, the left eye diverging so considerably as not to become cognizant of objects within an angle of near 45° from the direct line; when the left eye was closed, there was no apparent difference in the motions of the right, which remained normal.

When the sound eye was covered, the affected one directly became straight and he could see equally well with it, nor did it immediately upon the sound eye being uncovered jump back with a start (as some of our friends at home have generalized all cases to do), but continued for the space of half a minute in "statu quo," the right eye appearing the unsound one: —Evidently by these, proving, that there was no want of nervous energy, no paralysis, or other cause that would mitigate with, or render an operation unadvisable—but rather, that it was dependant upon some purely congenital deformity—a shortening probably of the muscle—the longer muscle or lever, being able by an effort of the will, to overcome the opposition offered by the shorter, but which, upon being allowed to return to its quiescent state, returned to its natural or rather unnatural squinting position, unless indeed (as was equally likely) it was purely dependant upon a want of nervous equilibrium; and, here a novice might have been mistaken—and really and conscientiously thought, that this was not a case admitting of cure, though such as were more used to see and judge of such appearances, would only attribute it to its true cause, being either an effect caused by and dependant on a particular volition of the will, during which the nervous power of the quiescent eye is as it were rendered subservient to the weaker organ, or, to that Vis inertiæ resident in these as well as in other organs, which not unfrequently occasion otherwise healthy eyes to squint for the space of a minute, whilst, in what is termed a brown study—deep reflection—or a communion of the mind within itself—the person himself not being at the time aware of it, until his attention being aroused, he immediately becomes aware of something wrong, and the affect disappears.—Who has not caught himself when in deep thought either leering or making a delicate squint?—what stockbroker, when his thoughts have been as deep in Spanish, or Brazilian, as his hands were in his pockets, has not fancied himself alone, when in a room full of company?

The eyes after all are deceptive organs, or if you please, not always to be trusted, (though lovers are apt to say that even squinting ones are sufficiently straight forward.) "Honi soit qui mal 'y pense!"

With the kind assistance of W. R. Smyth Esq. A. B. Surgeon 2nd Battalion Artillery and W. B. Thompson Esq. I proceeded to operate in the following manner:

The patient being seated in a high back chair, with a good light falling upon the outer portion and angle of the eye, I first raised and fixed the upper eyelid of the left eye, by means of the wire speculum, and handed it to Dr. **Smyth** who stood behind, and steadied the boy's head ; the lower lid being most effectually depressed by Dr. **Thompson** with his finger, a silk handkerchief being interposed to prevent the eyelid slipping from any lachrymation that might take place. Desiring now the patient to invert his eye as much as possible, I inserted a small sharp hook into the thick white coat of the eye *(sclerotica)* about three lines from the outer margin of the horny part *(cornea,)* and, having though this purchase, rotated the eye completely inwards, handed the hook to Dr. **Smyth**, who kept it steadied in the same position, whilst I proceeded with a pair of forceps (**Liston's**) to pinch up and divide in the perpendicular direction about four lines of the conjunctiva, or delicate lining membrane of the eye, when, the tendon of the external straight muscle was brought into view ; underneath which, a small blunt hook being now passed, and the tendon gently lifted from the sclerotica. it was immediately divided with a pair of curved scissors, the under blade of which was so passed under the uplifted tendon as to assure all present of the complete section of the muscle. The hook was now removed, and the eyelids allowed to close ; the operation, which occupied about a minute, being finished ; cold water was applied to the eye, and as he complained of feeling a little faint, he was desired to lie down and keep himself quiet for half an hour. No further after treatment required, but to keep indoors during the heat of the day; so as not to expose the eye unnecessarily to the sun.

The pain was trifling in comparison to what a person unacquainted with the operation would anticipate, and in the papers it was mentioned that there was not a drop of blood spilt, and such in the present, was the case, though it was rather an unusual thing, for generally speaking, two or three drops ooze out from the inner angle of the eye, and sometimes even where (as in children particularly,) there is spasm of the orbicularis (muscle closing the eye) or much resistance offered, so as to accelerate the circulation, a trifling hermorrhage takes place.

The notes upon this case immediately following the operation say—" He now sees straight before him, the same as any other individual—cannot turn the eye outwards—eye looks rather smaller.—The squint is gone and he feels highly pleased with his improved looks : though there is at present a redness or bloodshot appearance of the eye, more especially at the outer angle, the natural and invariable result following division of the minute vessels in this operation, but which usually begins to disappear in the course of a few days ; rarely leaving at the end of a month or six weeks, any other traces of the operation than the improved sight and appearance of the patient."

October 25th. This day the 20th from the operation—The boy squints a little inwards with the eye that was operated on for the squint outwards, nor can he turn the eye outwards above two thirds of the visual circle.—I am inclined to attribute this to the well known fact that three out of the four straight muscles of the orbit viz. the upper, lower, and inner muscles are supplied in common with the same nervous fillaments (as well seen in Figures 4 and 5 Plate IV) producing a sympathy of action between them, and which, as already stated, is apt to exert an undue influence, in drawing the eye inwards in case of the division of the outer straight muscle, and, seems to restore the balance of power in opposition to this muscle, when intact upon the division of the inner muscle ; further, I think it would have been more judicious to have kept the sound eye bandaged for about a fortnight subsequent, so as to have allowed of the free and *unbiassed* motions of the lately affected eye, and so give time for the muscular fibres, either in part to reunite, seek to form fresh adhesions, or become organized with the subjacent cellular tissue—indeed the contraction of the conjunctiva itself, or a habit, so much dwelt upon by some, of allowing the muscle to move in its normal direction, not to mention the attachment of the muscle to the ball of the eye—would doubtless have proved ample as a counter balancing power ; hence we must be prepared in these cases by a little extra attention to guard against a casualty of this nature,* the liabilities to which, how-

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* There is however an idea amongst many, that there is a difficulty in enticing the pupil to turn in, when it has struck work by *turning out.*

Mr. Duffin p. 104 5. Speaking of the *divergent Strabismus* says, "When the external rectus is cut across, we do not find the eye instantly start into its proper position, as it does when the internal muscle is divided. The pupil goes more gradually to the axis of the orbit, as if it were not drawn there by an active force, but went there because the restraining power no longer opposed the movement. It requires indeed, several days in some instances before it is reinstated, after the operation ; moreover, the capability of moving the eyes towards the nasal canthus by an effect of the will remain precisely the same as before.

Nothing has been gained in this respect ; the patient has not acquired the power of directing both eyes inwards simultaneously, in fact, all the apparent advantage is that, when quiescent, the pupils of both eyes occupy the visual axis of their respective orbits, instead of only one doing so, while the other is directed outwards."

Now this is totally opposed to the result of the cases that have come under my hands, and of which this Maty's, though but a solitary instance, isone m uch to the purpose, as tending to confirm the fact, that the only fear is (if *the muscle be clearly divided)* lest the eye should for a time be drawn too much towards the inner angle, and so for the moment spoil the beauty of the operation : and as for its requiring several days ever, would scarcely strike a person from their not being as my own experience teaches me, a *constant* concomitant of this operation ; though a tendency inwards, to a greater or less degree, is for the most part observable, as its immediate consequence, though but temporary ; and, we naturally endeavour to conciliate the feelings of the patient to the operation by avoiding all unnecessary or tiresome restraints—though with this case more immediately before my eyes, I think I should scarcely for the future consider myself justified in omitting a precaution, attendant with so little comparative inconvenience—nor can the operation be looked upon as fully successful, till, upon removal of the bandage at the end of that period, the eyes are observed to move in the same corresponding axes, and the end of the month shews them to remain in their relative normal positions—then, and then only, as this case shews, (and this is the great advantage of adducing cases in illustration, although I am aware that medical histories do not always lead to the improvement of strict science) can the operation be viewed as completely successful.—The question here naturally rises, what would be the effect in this or rather in cases where the eye turns comparatively too much inwards, of dividing the inner straight muscle of the same eye ? this is a question which Mr. Elliot has in part answered, and I think pretty ingeniously (when speaking of the same affection remaining after the division of the internal muscle in the double convergent squint), by proposing the division of the inner straight muscle of the apparent-

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to find its way there, why I myself, have never perceived that the pupil was longer in turning in after division of the outer muscle, than it is in turning out, after a like division of the inner muscle.

ly sound eye, upon the principle that it is only owing to a sympathy between the corresponding muscles, and which would be destroyed by a section of this muscle.—This view I should have felt inclined to take of the present case had it required it, in opposition to the advocates for dividing the inner muscle of the eye operated upon, though I believe there is no fear (as some have imagined,) of the eye remaining beyond a few days subsequent to such operation, as a staring eye, " in statu quo ;"—for the rationale that applies to the division and subsequent reunion of the inner muscle, in cases of simple squint inwards, applies with equal force to the present. I am not aware that Mr. Elliot in his writings makes mention of a case parallel to that of the Maty—but to which, I think the same views he entertains respecting double convergent squit would be equally applicable —nor do I doubt from the shrewdness of his observations generally, and the boldness and practical skill he has shewn in carrying them out in direct opposition to pre-conceived opinion, but that he would have ventured in this, as in the other cases of a converging nature which he mentions, to show his correctness by a succession of successful cases—one or two of which, as best illustrative of the subject as applied to the inner *mixed* squint, I shall here transcribe, especially as they bear directly upon a case which will presently come under our notice, Viz. that of the lad Burke.

Case 3. September 14th—" Miss Rennison, aged 13, squint of seven years duration. Inversion of the left eye so great, as nearly to conceal all the white internal to the cornea, when the right eye was straight, and the patient looking at an object placed before her; on closing the right eye, their position was reversed; but on raising its lid, the left eye instantly turned in again: right eye always made use of, as the vision of the left was very indistinct; abduction good, eye-balls small."

Operation.—"The left adductor was separated and divided; on uncovering the right eye, a slight inversion was still apparent in the left. On searching carefully with the blunt hook, it was found that all had been divided. The adductor of the right, and straight eye was then divided, which completely removed the remaining inversion of the left one, and restored the parallelism, at the same time rendering them equally prominent."

Remarks.—"The continued inversion of the left eye, evidently depended on its indistinct vision, as it was nearly useless. The operation on the second and straight eye was undertaken in order to remove the mutual convergence by depriving the motor nerves of their converging power. The power of inversion of both eyes after the operation was nearly natural, which might have been expected from the small size of the eye-balls."

"In a few days, there was a slight occasional inversion of the left eye, evidently made to prevent confusion of vision, as it was removed by closing the other eye, which did not become inverted in turn, as seen on raising its lid, when both eyes remained straight. By bandaging the right eye for two or three weeks, the vision of the left was much improved and parallelism restored."

Case 4th September 20th.—"John Dixon, aged 6. Very great inversion, and indistinct vision of left eye; position of the eye reversed on closing the right or straight one. Abduction of both good. Eye-balls large."

Operation.—" The left adductor was separated and divided. On uncovering the right eye, the left eye again turned in. A careful search with the blunt hook showed that all had been divided. On closing the right eye, and raising its lid, it was seen slightly inverted, though only for an instant."

" As the continued inversion of the left eye was thus proved to be the resnlt, not of a voluntary effort on the part of its muscles, but of the non-removal of the mutual convergence, the adductor of the right, and still straight eye was divided, without separating the muscle from the ball."

" Result.—Both eyes were perfectly straight on looking forwards."

Remarks.—" Both eyes required operation in this case, on account of the great converging power indicated by the great inversion of the left eye. As the eye-balls were large it is probable that the tendons of the superior and inferior recti were large in a corresponding degree. The case is an extremely beautiful one, and there has never been any renewal of the mutual convergence."

From the foregoing we might be apt to jump to a conclusion, that there was more certainty of ultimate success in cases of the convergent strabismus, than when it is divergent—but I think this would be both hasty and unphilosophical, seeing the numerous cases of this nature, which have been perfectly successful; nor do I think with the above mentioned precaution, we should have much cause to fear—after all, I believe the remedy to be as stated, and partially proved by analogy, in the above interesting cases of Mr. Elliott.

This effect however goes off *entirely*, but it will be gradually, as the natural powers of the eye become more equalised.

The last note on the Maty's case, six weeks after operation—states. Blood shot appearance of the eye completely gone—eye same size as the other—the lad has much more power over the eye outwards, and states that he feels he is daily getting a greater command over it;—can turn the eye in every other direction—squint completely removed—his not being able to rotate the left eye outwards, to any great extent, does not occasion the least tendency to squinting in the right, owing to the sympathy existing between the two eyes, the one accommodating itself to the other—for when he desires to look angularly to the left, instead of the right eye being turned in towards the nose, and the left remaining nearly centrical as might "a priori" have been supposed likely to take place—the head is itself slightly rotated, so as render this extreme action of the muscles unnecessary—so that to the casual observer, or to a person unacquainted with the defect, it is not in the least perceptible.—Now this fact of the power of turning the eye inwards not being recovered in this case at the end of a month, is beautifully contrasted by the following case of Miss———in which we will perceive, that though all power to turn the eye inwards was completely lost immediately after the operation, still, that by the end of a week subsequent to it, she had, without a return of the slightest tendency to squinting, completely recovered the full power to turn the eye inwards, or in fact to turn the eye in any direction.*—These facts when contrasted, though surprising at first sight, will I think admit of a ready explanation in the distribution of the nerves of the orbit.—The outer straight muscle being, as we have already shewn, supplied by a distinct nerve, unconnected with the other muscles moving the ball of the eye—so that upon being divided, the power of the eye outward is for the time lost; owing to there being no sympathetic nervous influence communicating with, and existing in the other muscles in relation to it.

Case II. Monday, October 11th, 1841.—Miss ———— Alternating Converging Strabismus (Strabismus Convergens Commistus.) The Strabismus cannot be regarded as confined to one eye, though the left is certainly most affected, for when the supposed sound eye is closed, the affected one becomes straight and moves well in any direction, except into the outer angle; but indeed neither of the eyes could do so properly, though the left, less of the two ; when, on the other hand, the unsound, or rather more defective eye was closed, the apparently sound eye also became perfectly straight and natural in its actions ; now under these circumstances, if the lid of the closed eye was suddenly or quickly raised, the pupil was perceived converged into the inner angle of the eye, and this upon repeated trial was found to be the case with either eye, though the position was generally soon reversed in favour of the right or stronger eye, as soon as by some sudden motion, word, or other cause, a change of position in the eyes, or the attention was sufficiently attracted, to break through the chain of action by which it was held temporarily in subjection to the weaker one: thus, evidently proving, the convergens to be mutual, as well as the want of parallelism between the optic axis of either eye: plainly pointing out the left as the weaker, and more defective of the two, and consequently the one to be operated on in the first instance; the object to be sought in this operation, not being the simple destruction of a physical resistance, but rather as before explained, the modification of a physiological action, and the establishment of harmony in the muscular contraction of the right and left sides.—Having forewarned both the parents, and the girl herself, from the double nature of the case, of the uncertainty of the operation upon one eye being sufficient, and the great probability of a second operation becoming necessary for the *complete* removal of the visual obliquity, I proceeded to perform the operation.

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* This leads me to allude to a very interesting case which occurred some years ago in the practice of M. Lisfranc. This celebrated operator having occasion to dissect deeply into the orbit at the inner canthus, for the purpose of exterpating a cancerous tumour imbedded there, the inner straight muscle was divided, and the effect of this, was, that the eyeball was immediately drawn outwards : when, however, the wound was healed, the divided muscle seems to have re-united ; for the eye recovered its normal axis (Buletin de Therapeutique 1840.)

The patient being seated angularly, with the left eye towards the light so as to avoid the eye being shadowed by the nose, or, by the hand of the operator,* the right eye was bandaged by a cambric handkerchief, and I proceeded, with the assistance of Drs. Smyth and Thompson, to operate as in the first case, the muscle being in like manner raised upon the blunt hook and completely divided, leaving the blue sclerotica perfectly distinct underneath—free from any cellular attachments.—The operation occupied about a minute—a few drops of blood oozed from the inner angle of the eye—her first expression upon opening her eyes immediately after the operation, was, " now I can see all round me—now I can see every body at once ;" exclamations extremely gratifying to all ; nor would she at first believe, until, repeatedly assured by her parents that the operation was over and that the eye now looked perfectly straight ; it was really gratifying though painful to hear her eager expressions and observe her state of excitement between doubt and hope, until the looking glass had assured her of what she could scarcely bring herself to believe. There is pain undoubtedly during the actual operation—but not what might reasonably be anticipated. —The young lady fainted after the operation, but in a few minutes recovered, and reclined on a sofa for about a quarter of an hour, when she returned pretty composed, and highly gratified with her improved appearance—upon raising the eyelids after the operation, the pupil was found perfectly centrical—but there sttll remained a slight cast visible now in the right eye, upon looking angularly to the left.—She felt exceedingly pleased and gratified by the success of the operation—said that the pain would not deter her from undergoing it again in the other eye should the least cast remain in it after waiting a short time.—Her sight is greatly improved—said " she could not before the operation have fancied she could ever be enabled to see so much better"—the eye could no longer be turned inwards—it was of course slightly blood-shot (this always increases a few hours afterwards as the blood becomes gradually effused) and the eye appeared somewhat smaller than the right one (more commonly perhaps it is more prominent)—cold water to be applied to the eye for the rest of the day, and an aperient powder to be taken at night.

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* Trifling as the incident may appear, it does deserve notice, for a good light is the first step of the operation, and on this first step, depends the success of the whole.

The young Lady bore the operation remarkably well ; her fainting afterwards was owing no doubt to the mixed causes of mental nervous excitement, pain, and weakness—she had not taken any nourishment for more than four and twenty hours previous, from the nervous state of excitement into which she was thrown by the very thoughts of the operation, and which, (as she afterwards owned,) had almost caused her to faint whilst seated in the chair, previous to its commencement. Neither her hands or person were confined, and the result shewed that with her, this would only have been a superfluous mode of creating alarm, though with many I have no doubt it would be safer to do so, as practised by Mr. Elliott and others.

I saw the young Lady on the following day—the eye though blood-shot, especially at the inner angle, was much less so than I had expected to find it, which was probably to be attributed to her fainting.—The eye appeared rather smaller—was not painful, and she had now removed the bandage and substituted a green shade—cold water being still applied to the eye.—I saw her occasionally afterwards—on the 7th day from the operation, the eye could be turned inwards, or in any other direction—on the 10th day the eye had returned to its natural size, and I lightly touched a slight granulation of the conjunctiva with the nitrate of silver—the case required no further looking to—at the end of the month, from the operation, no trace of it was to be perceived (with the exception of a granulation when the eye was averted) but her improved appearance—though there was (as at first remarked) a slight obliquity of the right eye apparent—a cast, or peculiar expression of countenance, when she looked to the left—in no other position of the eyes was it at all visible. This slight cast is dependent upon the same cause as when the unoperated on, or the apparently sound eye, becomes the affected one, as we perceive takes place in all cases of confirmed mixed (alternating) squint—and of which this was certainly one.—It is, as we have before noticed, owing to the parallelism of the eyes not being restored;—the eye being still under the nervous influence which operated in, but was not confined to, the divided muscle; and which influence now shews itself as it were, transfered to the other eye, through that peculiar and inexplicable sympathetic action independent of volition, which thus manifests itself in these peculiar cases.

The pathological views of Mr. Elliot of Carlisle on this subject, I consider to be the most correct, whose observations on this point have been most fully borne out by my own experience: though apparently in opposition to the views entertained by Mr. Duffin, Mr. Liston, and many others.

Mr. Liston's views on this point, as before stated, are rather different, nor has he been so fortunate in this as in the generality of his operations. He does not hold with the division of the (apparently) sound eye, considering it useless, or as Mr. Duffin expresses himself *mischievous*—though this is contrary to the direct and extensive experience of Mr. Elliot, whose enlightened views on this subject are exceedingly interesting.* Nor am I aware that either of the first named gentlemen have ever practically had recourse to this part of the operation against which they contend : the mischievous effects, however, of dividing a little too indiscriminately, either the upper or lower muscles of the eye (whose internal rectus has been cut,) though that eye should still retain its original obliquity of vision, is sufficiently obvious ; to say nothing of the propriety of proceeding thus at all, which is not only exremely doubtful, but I should be inclined to say,

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(* Lancet for September 19th and October 31, 1840.)

"This continued squint or inversion which is still confined to the eye, whose adductor has been divided, when both eyes are uncovered, and the patient looking before him, has been attributed, to very different causes, such as an undue contraction of the inner fibres of the upper or lower straight muscles, an unhealthy state of the conjunctiva, the eye-ball returning to its bed of membrane and fat, like a cast in a mould, an imperfect division of the adductor and its cellular tissue &c. &c. and the practice adopted for its removal has varied according to the views entertained by those writers as to the reasons of the continued inclination inwards of the eye. It is on account of the difficulty of removing the converging tendency that I now invariably adopt the practice of dividing the second adductor, when an inversion however slight, is seen in either eye on looking forwards, after the division of the first adductor, not to mention the improvement in the appearance of the eyes by rendering them sympathetical."

(The eyes then only requiring to be accustomed to their new association or parallelism of by a little side-practice.—Ed.)

"In one case only has the division of both adductors failed in removing the squint, and I can only attribute it to ths habit acquired by the upper and lower straight muscles, as an interval of three weeks passed over before the second operation was had rocourse to. A search was made at the same time to ascertain if the first adductor had formed a new attachment to the ball, but the latter was found quite clear. Though the person still squints, the effect of the division of the adductor of the straight eye was greater on the inverted one, than the division of its own adductor."

is, too limited a view to take of the well known sympathetic relations existing between and influencing the corresponding actions of both eyes, and which the following case, which came under my immediate notice may in some measure tend to illustrate.—Mr. J. G. æt. 35, a gentleman of independent property, had from childhood been afflicted with a double convergent squint, and for the removal of which, he applied to Mr. Duffin, of Langham Place, having become acquainted with that gentleman's name, and pathological experiments upon the canine species, through his writings in the Lancet. Mr. D. proceeded to perform the operation in his own peculiar manner, as described and strongly recommended by him in one or more of the Lancets, but, unfortunately, without the expected success ; for though the inner straight muscle was as he felt assured, completely divided, the pupil still obstinately persisted in retaining its position at the inner angle of the orbit ;—now as this was contrary to Mr. Duffin's pre-conceived notions of the correct, he put a bandage on the sound eye, and thereby relieved the other from its angular position—into which (as Mr. Gutherie has it,) it had most probably become imbedded—in the hope that time, the cure for as well as the destroyer of all things, would work a miracle in his case : directing him to return at the end of a fortnight, by which time he would have probably gained a sufficient command over the eye.—When at the end of this period Mr. G. again presented himself—Mr. D. was certainly not a little chagrined to find that no sooner did he remove the bandage from the right eye—but the left immediately returned as it were to its comfortable bed again—Now, as Mr. Duffin expresses himself with regard to Mr. Elliot's operation, it would have been "*absurd* and *unphilosophical*" to divide the internal straight muscle of a sound eye (apparently sound); and as in his opinion it could be nothing else but the inner fibres of the upper and lower straight muscles, he therefore proceeded to divide, first, a few of the inner fibres of the lower straight muscle; this having no apparent effect, he did the same to the upper straight muscle, but here the effect was stranger still, for the eye now looked directly upwards—giving the unfortunate patient by no means either an improved or a preposessing appearance:—there was now nothing left for him but to divide (as he said) *completely* the upper straight muscle—but to this the patient demurred, wishing to escape for the time, and consider a little about it—he did consider—and his consideration led him next to consult Mr. Liston, of whose ability and skill his splendid operations were the best guarantee.—Mr. L. immediately recommended and proceeded to divide the upper straight muscle, when lo and behold!—by some hocus pocus—the pupil of the eye shot upwards, made itself a "fresh bed" (Guthrie) under the upper eyelid, and refused to be seen at all—"Finis coronat opus":—this was a bad job, and he returned home with the consolation at least that he had had the best advice, and the most that could be, had been done for his eye—in other words, the certainty that his eye had been done for:*—being myself in town at the time as we were old acquaintance,—having heard of my success, he under these circumstances applied for my opinion on his case ; when after hearing the above detail, and having attentively examined the eye, I could only come to the conclusion that, allowing the upper straight muscle to have been fully divided, the whole of the mischief was owing to the inferior oblique, which now held very undue command over the eye, the centrical steadiness of which had been lost by the division of two, and partial incision of a third, of the four straight muscles of the eye—one of whose chief duties is, when acting together, to steady the pupil in its centrical position, as well as when acting singly to draw the eyes in any given direction.—Not being in this case at all certain of affording relief, I declined interfering lest I should only further mutilate instead of benefitting my poor friend :—regretting that he had not, in the first place, applied to me, when, from the above view of the case I doubt not his vision would have been completely restored, by the simple division of the corresponding muscle of the so termed sound eye ; for one of the principal features that attract our attention in this painfully interesting case, is the revolving of the eyeball. We have seen that when the eyelids are shut, the recti or voluntary muscles resign their office, the inferior oblique muscle gains power, and the eyeball traverses so as to raise the pupil. Neither has it escaped observation, that when from some accidental injury of the rectus attollens,

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* Mr. Duffin relates a case not dissimilar to the present, except in its result—and which is here mentioned as shewing more fully perhaps his views on this point; and in which the pupil turned inwards and upwards, was, after the section of the internal rectus turned right upwards; and was

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restored to its natural position only by the section of the superior rectus. Mr. Duffin never met with any other case requiring the section of the superior rectus, but he mentions one which occurred in the practice of a professional friend. In such cases, in which, *prior to operation*, the pupil is turned upwards and inwards, Mr. Duffin conjectures there may exist paralysis, either partial or complete, of the inferior rectus.

the pupil of the eye is depressed, and cannot be elevated by a voluntary act for the purpose of vision; upon an attempt to close the eyelids being made, the ball of the eye itself is at the same time thus raised involuntarily, a proof that this insensible motion is performed by the *lower oblique*, and not by the *superior rectus muscle.*

The next Case, was that of a child four years of age, (sister of Miss ————), and upon whom it was my intention to have operated immediately after her elder sister; for which purpose I proceeded with a folded table cloth to confine the child's arms and body to the back of the chair, and also in like manner to make fast the legs, the only safe manner recommended and generally adopted in operating upon children of this age—when they are too strong to be held gently yet firmly in arms;* however, when thus prepared, the great opposition the child offered by crying and struggling—altogether precluded the thoughts of proceeding—for though undoubtedly the struggles of the child might have been overcome—still the flowing of tears would, of itself, have been disadvantageous to the clear performance of the supposed operation—to say nothing of the fear of convulsions, or the natural fear of a parent present.† The child had unfortunately been continually frightened since the previous day, by her little brother, a year or two older, with the idea that the Doctor was coming on the next day ‘ to poke her eye out’—and this same little fellow, when, after the operation, he saw his eldest sister’s eye with a handkerchief over it, cried most pitiously, exclaiming, that “ the Doctor had poked his sister’s eye out.”*

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* Sometimes it may be found more convenient, as in the other operations on the eye, to confine the child on a couch; but, the mode of securing the little (im) patients, so that it be effectual and convenient may be left to the judgment of the operator.

† The fear of convulsions, is more imaginary than real—to wit—see the operations for stone, Nœvi, (vern. mothers mark) or cataract performed upon children at this, as well as at an earlier age—see likewise cases related by Messrs. Lucas, Duffin, Elliot, Guthrie, and others, who have operated successfully on children of all ages. In fact it may with safety be performed at any age between one and sixty, before or after which it can scarcely be deemed either advisable or called for.

This age is perhaps, the most unfit for the satisfactory performance of this operation—as the children are too old to be completely blinded as to the nature of the proceedings, and too young to be reasoned with—a child 2 years of age would no doubt be far preferable, as it could be held quiet on a person’s lap, and there would be no fear of consequences that might arise from the intense state of mental excitement in the elder, should this operation be proceeded with “ vi et armis,” in spite of its struggles and screams.

At both of these years I have, however operated, and with success—though I should not I think seek to do so again, nor would I on the other hand refuse to operate at the special desire of the parents.

Mr. Guthrie and others have been equally successful in similar cases, and the former gentleman strongly recommends an early operation, upon the principle that the squinting impression will thus not be suffered to increase with the child’s years, and the eyes will early be accustomed to act together: to say nothing of a blemish in a child at an age particularly interesting to the pride and affections of a mother.—

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* It appeared to be the opinion of those present, that it would be better to postpone the operation till the child was a few years older: and to which I of course defered, there being no *necessity* for its performance then, more than at any future period; For doubtless when old enough to appreciate the benefits of the operation, she would joyfully submit to undergo the trifling pain which it occasions.

This last is the strongest, and I think the only reason that can recommend an early operation.—I do not believe that the squinting when congenital, ever becomes much worse, or that there is any fear of the eyes not acting together, when the impediment to their doing so is removed—It is an operation that can be performed with safety and success at any age (as we also perceive from the cases related by Mr. P. Bennett Lucas p.) though after the age of 12 years would of the two be preferable to before that period.*—In the case of the child between 4 and 5 years of age upon whom I operated, I attribute the success of the operation to having taken the child by surprise, and proceeded immediately by gentle, but firm and decided coercion.

I had five persons brought to me for inspection on October 19th, three young women sisters,—and two children ; the latter between the years of 4 and 6 —upon none of whom I operated.—The cases of the three young women, were in each, the squint upwards, (rather unusual) complicated with cataract, and following upon an attack of the country sore eyes : of course to meddle with these was out of the question. —In the case of the younger of the children, (Mrs.

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* It will be perceived from the above remarks, that though I fear no consequences from an early operation, I would not out of regard to the common opinion of parents, as well as of the public generally, seek to perform upon young subjects, especially as I have before stated there is no *necessity* for it.—It must not be lost sight of, that whatever ailment befals the little patient during the twelvemonth, or perhaps many years subsequent to the operation, it, and it alone, will, in the minds of the sagacious parents be blamed for all.—Of course if the child a week or so after the operation should by bad luck catch the Measles, through being casually brought within its influence ; who doubts, but that it was an effort of nature to relieve itself of the fever into which it had been thrown by the operation ?

Curtain's child) it followed upon disease of the bowels, about two years and a half ago: was not constant, but at times, more especially when excited, as when in a passion, when it became very apparent. As the child was of a scrophulous habit—subject to inflamed eyes—evidently not in a sound state of health—and it appeared to the mother that the child squinted much less now than three months back, her health being at that time worse, I had every reason to believe, that as it was apparently consequent upon derangement of the alimentary canal, so, as the child improved in strength and years, the deformity would gradually wear off.* Hence I declined interfering in this case also.—The elder of the children (little

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* Squinting in children is a frequent effect of the weakness subsequent to long fevers, and which gradually disappears as the child gains strength.—We also observe it as well as double vision, as a concomitant to delirium in phrenitis, also in some fevers more particularly—and which symptom proceeds in all likelihood, from an unequal tension of the muscles of the eye-ball, or an unequal degree of the distribution of nervous power; unless indeed it be dependent upon actual disorganization of the nervous structures. We have a highly interesting case at the Artillery Dépot, where it followed upon Hydrocephalus occasioned by a severe fall on the back part of the head. In this case the sight of the affected eye is also nearly destroyed.

The following observations on this subject by J. Walker, Esq. of Manchester, (Lancet, Aug. 7, 1841) are both extremely lucid and comprehensive.

" In some instances, and more particularly in adults, strabismus is an accompaniment of Amaurosis, although the latter is frequently witnessed without the former. I apprehend that when the two are combined, it will generally happen that the cause of the mischief is in the brain, affecting the optic and motor nerves either in their origin or course; and that when amaurosis is the result of disease of the retina, or of the optic nerve alone, then strabismus will be less likely to exist .... Strabismus, indeed, is often one of the earliest indications of some disordered action of the brain; and I have witnessed many cases of strabismus arising in infancy or childhood. Sometimes, doubtless, irritation in more remote organs, operating through the medium of the nervous system, may induce this affection, such as teething, worms, derangement of the digestive functions and the like. Blows about the orbital region and injury of the frontal nerve, are also thought sometimes to produce this affection. Mental emotions, such as fright, have likewise been considered as an occasional cause of strabismus.

Flynn), was the only decided case of convergent squint admitting of cure ; the parent, however though induced from anxiety for her child, to come and consult me, was also from an over anxiety, induced to defer having it performed, trusting to time to cure that which was a natural defect, and apparently hereditary, if such indeed ever be the case—at least certain it is that the father has a very decided squint ; on the other hand, there are two other children in the family who have not the slightest cast.

Again, there is the case of the lad Burke, stepson of the late Sergeant Major Burke, who lately perished in the Golconda ; he has squinted from birth, and his father, to use the widow's expression, had a most beautiful (a most abominable) squint—this however, if an heir loom, has also descended to one out of three children—and that, from what the mother says, in a much less degree. Mrs. Flynn, the mother of the first named little girl, who was fearful of having anything done to her child on October 19th, again called upon me with her child on the 27th, wishing me, if I thought it a proper case, to perform the operation when convenient. I now re-examined the child more attentively, and found this to be pretty well the state of the case. The child does not always squint with one eye—but sometimes it is the left, at other times the right. It is an internal congenital squint (supposed to be hereditary from the father), affecting indifferently both eyes—more frequently the left—though one eye only is affected at a time—occasionally she looks for a minute perfectly straight.—A year ago the child was near losing her sight from a severe inflammation in both eyes, which has left a very slight *nebula* (cloudiness) on the *cornea* of the left eye—though this does not apparently in the least affect the sight—and it is mentioned here more with regard to the impracticability of performing the operation from the violent crying and resistance that is justly surmised would be experienced in the performance of it, as she evidently retains an acute recollection of the pain she then suffered from the local applications made use of—the simple attempt to examine the eyes with the finger, by raising and depressing the lid, affording a sufficient sample of what might be expected. From the above, I am of opinion that the operation would be required successively on both eyes, as that eye only which was operated on would be relieved, the other eye probably becoming more permanently convergent. On the other hand, it may not be so, but the division of the affected muscle in one eye might be the means of restoring the harmony of action between both. I do not view this as a case of permanent contraction of either muscle, as is sufficiently self-evident, but, as one of purely diseased nervous action, a want of balance between the contracting powers, and which the section of the muscle by dividing the nerves would restore, throwing the whole inner motor influence to the sound eye, bringing the other, as its shade or dependent, to follow and accommodate itself to its various movements.

Again, we meet with cases wherein, although the parties themselves are anxious to have the operation performed, yet still from some physical debility, or a want of moral courage, they cannot sufficiently control themselves to submit quietly to it, but, by spasmodic, or involuntary contractions of the muscles, both, of the head, and orbit, effectually preclude all chances of operating with success—at least, though it were successful, it certainly would be at the risk of injuring the eye itself.—The following is a case in point.

The man, a native about 50 years of age, was Coachman to a Lady residing at Peramboor, and had come over to me at his own desire, by permission of his Mistress, with whom I have the honor of being acquainted. Has squinted from birth. It is a convergent squint of the left eye, permanent, except when the right eye is closed, the left then becomes straight, but immediately reverts to its original position as soon as the other eye lid is raised. If, the right eye being thus closed, and the left looking straight, the eye lid be suddenly raised, the pupil of the right eye will be found turned in towards the angle of the nose---shewing rather, a want of balance between the motor nervous influence of the two eyes, than a contraction of any one muscle in particular---here then, was a greater probability even, than in the foregoing, that the division on one eye would have proved sufficient, though it, likewise might have called for a subsequent division of the second.—There was no doubt of the ultimate success of the operation.* I cannot, I think more clearly shew the opinion on this case, than by referring to the copy, of a letter written upon the subject, to the Lady in whose service he is.

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* The man had cataract forming in both eyes, from which he will eventually lose his sight, but this would in no wise have interfered with the success of the present Operation—nor do I think it would in the least have tended to hasten their formation—but rather the reverse. —This was also the opinion of Dr. Thompson whose attention was immediately drawn to them.

Monday October 25th 1841.

My Dear Mrs. ———

Thank you for sending your Coachman, who arrived here at ½ past one, though I regret to say it was to no purpose.—He behaved worse than a child---I should not under these circumstances have been warranted in attempting to proceed---such was the impression on my own mind, and such was the impression on the minds of the gentlemen present viz. of the Brigadier Ketchen, Dr. Smyth, Dr. Thompson, and Dr. Porteous. The man was evidently *willing* but *could not* command himself.

It is only necessary here, to add, that I had actually to replace the speculum itself, under the eyelid no less than 5 times, as even that appeared to create an irritation producing involuntary spasmodic closure of the lids, and upon my twice attempting to insert the small hook, the eye was not only spasmodically closed in defiance of Speculum and finger, but the head also forcibly drawn back. I was heartily glad that I had not taken a firm hold of the Sclerotica, as mischief might have happened. I next determined to do without the sharp hook, and endeavoured to seize a fold of the conjunctiva directly upon his rotating the eye outwards,but in this,from the same cause I of course, failed---for no sooner did he feel the blunt point of the forceps, than the eye was immediately closed as before---He was now given a little wine and water and allowed to rest for a few minutes, and again an attempt was made, but this failing from the same unsteadiness of the eye, it was evident that this was a case that could not be proceeded with without iminent danger to the ball of the eye itself : shewing, that all cases will not admit of operation, even when there is no apparent hindrance.

I will now, before proceeding to further cases, just give an outline of the operation I before alluded to, as being the first I performed in England, as well as the first operation of the kind that took place in the undermentioned part of the country. It is so far interesting as allowing of the testimony of those who witnessed its effects—also from its being performed after the manner recommended by D. Ross Leitch, Esq. of Teignmouth, Northumberland (Lancet, August 1st. 1840)—by making an horizontal instead of a perpendicular incision (see plate 7) of the conjunctiva in the first instance, with the view of avoiding much of the ecchymosis which is consequent upon the freer division of the Vessels running to the *Cornea* when the latter method is adopted—but which (the perpendicular) I at present pursue, considering the trifling difference of chemosis to be more than counterbalanced, by obtaining a better view, and having more command over its successful performance—The steps of the operation itself do not directly appear—but I prefer giving the cursory notes (meant for my own eye only) verbatim, as entered in my private Journal.

"Case—*Strabismus Convergens*—single—Oundle, Northamptonshire—*Sunday, October the* 18*th* 1840. Operated on George Britchfield Æt 12, at the Union Workhouse, for the division of the inner straight muscle of the right eye.

19th.—Pretty considerable ecchymosis at and surrounding the incision in the conjunctiva, also a slight infiltration of the conjunctival Vessels at the upper margin of the cornea, giving it a light Claret appearance, perceptible upon elevating the upper eyelid—There is a slight though remarkable prominence of the eye—does not experience any pain in the eye—and is perfectly satisfied—I simply prescribed a little saline medicine to be taken during the day, with small doses of calomel every two hours, and cold water dressing to the eye, with the view of preventing further effusion, and promoting absorption in the capillaries (minute vessels of the eye.)

Tuesday 27th.—The ecchymosis though less, still continues--touched it lightly with the Blue stone, and applied a small piece of court plaster to the outer angle of the upper eye-lid, to direct the eye habitually more inwards.

28th.—Touched the ecchymosed spots very lightly with the caustic pencil—as he has had nothing applied to the eye for the last few days—says he feels very well—no pain whatever—and is very much pleased with the success of the operation, the sight being much improved,—I directed that he might go about as usual"—

Remarks (made at the time)—" This my first operation, though successful, would have afforded me greater satisfaction had its delicate and apparent simplicity not been interfered with by the three following causes :—1st. The want of proper assistance—2ndly. In making my horizontal incision (after the mode of Mr. D. Ross Leitch, but with the scissors instead of the knife) I did not take sufficient care to make it on a line with, or rather a little below the inferior margin of the Cornea, by which I could not so readily insert the blunt hook under the tendon of the muscle : but, which having pretty easily accomplished, the boy unfortunately at this instant moved his head, at the same time complaining of the pain at the upper and outer part of the orbit, occasioned by the undue pressure of the assistants finger, (no speculum was used) and in so doing dislodged my hold of the tendon. Having immediately retaken it, and, as the patient appeared to become every instant more unsteady, I immediately divided the tendon upwards, though still covered by the conjunctiva, and in so doing of course included the membrane in the incision—3rdly.—In my haste to finish the operation, I divided the tendon perhaps rather too near its insertion in the sclerotica.

Hence it appears, that from the want of proper assistance, I in the first place divided the conjunctiva perpendicularly upwards, and secondly, the tendon of the internal rectus muscle too near to the cornea, neither of which it was my intention to have done ; hence likewise, owing to the angular wound of the conjunctiva, the ecchymosis &c. which I flatter myself would otherwise have been extremely slight. Nov. 5 1840."

It will thus be perceived, that I operate at the present much in the same manner as I did then, with the exception that in this case, I proceeded according to the method recommended by D. Ross Leitch Esq. by making an horizontal instead of a perpendicular incision through the conjunctiva. The alleged superiority however of this mode of proceeding I consider extremely doubtful—the ecchymosis is a secondary consideration in comparison to the perfect and free division of the muscle, and its adherent cellular membrane,—and which is by no means so easy of accomplishment performed in the manner recommended by that gentleman, though it would at first sight appear to be an extremely simple and ingenious method of proceeding. In fact, the more I see of the operation, the more I am impressed with the necessity of making in the first instance, a clear, clean, and *free* division of the conjunctiva.

November 5th.--Case v.—As Miss —— had by this time nearly recovered from the ecchymosis of the left eye occasioned by the first operation—and, been sufficiently pleased with it, to feel extremely anxious to have it repeated upon the right eye ("to which she had made up her mind to submit, even had the amount of pain" as she expressed herself "been three times what it was").* I proceeded to operate this day on the right eye, as before, with the assistance of Drs. Smyth and Thompson, but that I now used the knife instead of the scissors;—to this I was induced, from being desirous to submit to Dr. Smyth the comparative merits of the knife, or Scissors, from his being impressed with the superiority of the former over the latter, and which (at least in my hands,) proved the superiority of the latter over the former, in many respects, as I had myself found from experience to have been the case before—Dr. Smyth cautiously fearing the apparent danger of wounding the upper eyelid in the act of dividing the muscle—the upper eyelid certainly *appearing* to be in danger—though I think this is more in appearance than reality—the blades of the scissors when open *appearing*, as it were, to enclose the lid, but, which, in reality is not the case ; such an occurrence though it might happen, is not I think much to be feared, and I have not heard of its having occurred. I found the operation both more difficult, and was longer about it : finishing after all with the scissors—the operation with the knife having taken about double the time occupied by the scissors—the pain, as the young lady feelingly expressed herself, being much greater—for she scarcely felt the pain occasioned by the *scissors*, but expressed herself to have experienced the sensation of hearing the ***knife*** grating upon the tendon, this, we may account for by the tension of the eyeball produced by passing the knife under the tendon and cutting or rather sawing (for it must be a sawing motion) its way out, pulling as it were upon the eye.—The instruments (Weiss's) were as sharp as the best makers can turn them out—always kept ready for use, therefore not to be blamed ; however, it is, as I before observed, probably more a matter of taste as far as the operator himself is concerned, but with regard to the patient's feelings I should recommend the scissors. The whole of the tendon was not in the first instance caught up by the hook and divided—so that after dropping the lids and re-opening them—the eye still in a measure turned inwards ; this was immediately rectified by passing the scissors under the remaining undivided portion, when the eye assumed a straight position, neither could it be turned in—the young lady now looking perfectly straight with both eyes.* Immmediately after the operation, when a looking glass was placed in the patient's hands, the poor girl was both surprised and shocked to perceive, as she fancied, that the pupil of the left eye was now turned outwards---However as her eyes *were* perfetly straight, we could scarcely help smiling, while re-assuring her by shewing that it was only owing to a want of parallelism between the two eyes, which, when looking in the glass, allowed the newly liberated eye, from not being used to its new position, to throw the left (reflected in the glass) apparently at a divergent angle, when in reality it did not do so, and which, the space of two or three days would probably remedy ; the organ here requiring practice, the same as we perceive is requisite, especially when performed on young subjects, after the other operations on the eye ; cataract &c., the sight like touch requiring practice for perfection---in this case it was owing more immediately to the rays of light impinging upon dissimilar or non corresponding parts of the retinæ, that of the right being comparatively speaking thrown too much on its external optic axis.---I may as well at once mention in conclusion of this case---that on November 16th I touched the granulation which had formed (at the inner angle of the right eye), pretty freely with the lunar caustic, and, as there was also a little granulation encroaching on the caruncula lachrymalis still remaining from the operation on the left eye, I snipped it off with the scissors, and slightly touched the surface in like manner with the caustic ; the snipping of the scissors she expressed herself " she could scarcely feel," in fact she did not appearto know that it was done: but the caustic evidently occasioned great smarting for the time—I have scarcely ever had the pleasure of having under my hands so docile, and at the same time so cooly resolute a patient. This leads me again to say, that much, if not as much, of the success of the operation, depends upon the patient as upon the operator.

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* I felt equally anxious with the young lady that the operation should no longer be delayed, from observing in the eye which has been operated on a gradually increasing tendency to return to its original converging direction. (see observations p. 64.)

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* This is no certain criterion as to whether the muscle has been

22nd—Says that she is doing very well, and is quite satisfied with her improved appearance and sight.

Case vi.—Ed. Burke Æt 13: (the lad mentioned p.50.) "Alternating convergent strabismus--" Immediately after concluding the preceding case we now in like manner proceeded to operate upon this lad, using however the scissors only.---He did not struggle or resist bodily (though it was necessary to hold one of his hands towards the close of the operation), but considerable difficulty was experienced in consequence of the violent spasmodic contraction of the obicularis (the muscle closing the eye), which, as under such circumstances is the case, produced partial inversion of the lids, that is, forcing the lining membrane of the upper eyelid downwards, and of the lower one upwards; so as at times completely to cover the eyeball, in spite of all attempts to bring it clearly into view, by raising the former, and depressing the latter---however, with a little patience and perseverance, this diffi-

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completely divided (see Mr. Elliot's remarks p. 62 in connection with my observations on the subject pp. 67-8.—See also Mrs. N——case further on) but it is always advisable when the case admits of the least doubt on this point, to refix the eye and ascertain wih the blunt hook or probe, whether it be so or not.

culty was overcome ;* though it occasioned a necessity for the speculum to be reapplied two or three times before proceeding, and caused the lower lid to slip from the assistant's finger twice during the most critical part of the operation.---That the tendon of the muscle in this case was *completely* divided, I am not prepared to say, as there was scarcely any field for observation, and it will be necessary to divide the corresponding muscle of the right eye before we can ascertain exactly the effect of the operation on the left, as shewn by Mr. Elliot in a variety of parallel cases, of which the two above mentioned (p. 34) will prove sufficient to illustrate ; again, in the same number (Lancet October 31st 1840.) he remarks, in connection with his observations, note p. 43, " If the patient is unable to invert the eye beyond the centre of the orbit, the operation is complete as regards that eye, and this has been mentioned by different authors as the only test of the operation having been perfectly performed. In the great majority of cases, I have found, however, that the eye could be inverted considerably beyond that point ; but not so as to conceal all the white of the eye, on the inner margin of the cornea, though the complete division of the tendon and cellular tissue connecting the muscle to the ball was proved, in some of these cases by the clean exposure of the inner surface of the globe, and in all by a careful search with the blunt hook." However, that the eye is relieved in this case is evident.—I proposed that we should immediately proceed to operate on the right eye, to save time, and a vast amount of fu-

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* I mention this case (the notes of which I chance to have by me) merely as one illustrative of an occurrence which frequently takes place when there is spasm, or involuntary and forcible action of the orbicularis. " Wednesday Nov. 4, 1840. I this day assisted Ed. Webster Esq. (Oundle Northamptonshire) in the operation for Strabismus convergens upon Eliza Tibbult aged 13. Standing behind the child with her head leaning against my chest, I, with the fore-finger of my left hand elevated the superior eyelid, at the same time that I depressed the lower lid with the finger of the right-hand. Mr. W. having inserted the hook into the sclerotica and turned the eye outwards, operated as I had done (using the knife instead of the scissors), by the horizontal incision recommended by D. R. Leitch Esq. (Northumberland). He readily passed the hook from above downwards, and immediately seized the tendon of the muscle, but which unfortunately slipped from the hook ; he again seized it directly, and divided it upon the knife. The operation being thus completed, cold water was applied to the eye, and she had a couple of pills at night.

Thursday 5.—There is a good deal of ecchymosis about the eye, but this of course is always more or less the case—she feels no pain whatever—is in capital spirits—can turn tke eye *completely* out, when the otheris closed, (which she could not before the operation)—but when the eyes are allowed to act together there is still a considerable obliquity of vision, dependant upon that sympathy between the eyes first pointed out and remedied by Mr. Elliott of Newcastle, by a correspondent division of the inner straight muscle of the sound, or rather apparently sound eye, and the correctness of which I have myself repeatedly proved both at home and in this country.

Mr. W. acting upon this idea, proceeded on the 2d of December to operate upon the corresponding eye, but after dividing the conjunctiva was utterly unable to proceed to complete the section of the muscle, owing to the great unsteadiness of the girl and difficulty in keeping the lids apart, so as in fact to be enabled to get a view of the eye itself owing to the eversion of the lids—she of course squints more so, now, with the left than with the right eye—there is no question but that the girl would have been perfectly relieved had the operation been completed by the section of the tendon. I in this case first attempted to use the wire speculum, but found I could not command the eye so readily as with the fingers ; and hence, I may take the opportunity of observing, that to keep the eyelids steadily open is in fact the most, and only difficult part of the operation ; neither is this so easily accomplished, let people say what they will (when there is spasm or involuntary and forcible action of the muscle), for with the speculum, complaint is made of pressure on the brow if applied sufficiently tight to answer the purpose intended, and if not, the orbicularis obtains the mastery ; on the other hand, the fingers cannot steadily keep the lids fixed, against the excited action of the orbicularis, which, acting forcibly in opposition to them, causes eversion and projection of the eyelids, which of course nearly close the eye, interfere much with the sight of the operator, and gives to this beautifully simple operation, a deceptiously formidable appearance. The question here naturally arises —1st Are any specula at all required, and if so, which answers best ? and 2ndly, which is the best mode of performing the operation : that advocated by Messieurs Fagg and Lane, Lancet Oct. 31, 1840.—D. Ross Leitch —or Elliott" of Carlisle ?

A pretty considerable experience in this operation, since writing the above, has sufficiently assured me, that my present mode of proceeding, with the mere speculum and scissors, is perhaps, on the whole the most easy and successful.—I afterwards assisted the same gentleman in a similar case upon a farming lad of 19 in which he was perfectly successful.

ture anxiety and trouble to the boy---besides, I advocate operating upon both eyes at once---there is nothing gained by delay, but the reverse, for as the converging, though not the inversion, is always in these cases shared by both eyes, so ought the operation to be proceeded with on either, provided the parallel axis of the eyes be not restored by the division of one adductor, for, in such cases, I am impressed with the advantages derived from the immediate division of both adductors, so as to remove the mutual converging tendency as soon as possible; the propriety of this, is illustrated in the case of Miss—— (p. 58.); otherwise the habit assumed by the upper and lower straight muscles may be so powerful, as to require operation on them also; or as is more generally the case, the eye whose tendon has been divided, being of the two the weaker, and interfering as it does with the sight of the stronger eye, is gradually brought under its influence, and made to adapt itself to its powers, by being now, as in the first instance put out of the way, by being drawn into its old quarters—the inner angle of the eye.

Though the eye that squints most is, as I have before mentioned, the one usually first divided, the propriety of this proceeding is questionable; for if these views (which coincide with Mr. Elliot's) be correct, strictly speaking, the weaker eye should be accommodated, and not the stronger one—however this is of no material consequence, and the patients themselves have no fancy to have what they term their sound eye interfered with—of course these remarks do not apply to Luscitas—but only where we have ascertained the convergens to be mutual, though shewing itself more particularly in one eye*—thereby making the eyes equal in power, mutually dependent upon each other, and as it were, driving them through a necessity of mutual accommodation, to move in their true relative parallel axes; though this internal convergence of the eye be either diminished or altogether lost for the time being;—in other cases the true parallelism of the eye does not take place for a few days, or even more, giving rise to double vision.—More or less Double Vision is however a necessary consequence of the operation, but passes off in a few days.†

By operating immediately the fear of a future operation is avoided, the eyes are immediately allowed to adapt themselves to their parallel axes, and the inconvenience of a lengthened delay of the ecchymosed state of one eye is removed.—However as in this case it was the opinion of those present that any further operation should for a time be delayed, it was of course postponed—the lad remaining in "statu quo," apparently without having derived much perceptible benefit from the operation.—The boy (as all boys will) promising to undergo it again and be perfectly quiet at any future time ; though, that, *I very much* doubt, at least for some years to come. It leaves an impression of fear, as well as of disappointment on the mind of the patient, not so easily to be shaken off, even upon assurance of ultimate benefit. In allusion to this continued inversion of the eye after operation, I cannot more clearly express the general views entertained, than by requoting the words of Mr. Elliot--"This continued squint or inversion, which is still confined to the eye whose adductor has been divided, when both eyes are uncovered, and the patient looking before him, has been attributed to very different causes ; such as an undue contraction of the inner fibres of the upper or lower straight muscles, an unhealthy state of the conjunctiva, union by the first intention,* the eye-ball returning to its bed of membrane and fat, like a cast in a mould, (Guthrie) an imperfect division of the adductor and its cellular tissue &c. &c. and the practice adopted for its removal, has varied according to the views entertained by those writers, as to the reason, of the continued inclination inwards of the eye."

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* See a case mentioned by Elliott in conclusion to the note p. 43.

† Very generally, for a short time after the operation, there will be double vision, and this may last for a few days. or a few weeks, though I recollect reading of a case in which it exceeded two months; this case occurred under the care of C. R. Hall Esq. and is related in the London Medl. Gazette for January 22d 1841. Double vision did not occur after Eason's case; though it did for about a week after the second operation on Miss——This effect, occurring as it does immediately after the operation, and not existing previous to it, when the eyes were so much further removed from their natural axes; may thus satisfactorily be accounted for. The rays of light from the object regarded by the sound eye, were either not all received on the retina of the squinting eye, or if so, received in a place considerably removed from the most sensible part, and the impression on which therefore was too weak to fix the attention, whilst after the operation, the rays falling in the operated eye on a part of the retina nearer the centre, the sensation is strong enough to attract notice, but, the axes of the two eyes not quite corresponding, yet, double vision takes place, though, as we perceive in many cases (John Eason's for instance) a considerable improvement in the vision is frequently the immediate result of the operation. However this inconvenience is but temporary, lasting in fact only until the eyes have learnt sufficiently to accommodate themselves to each other, the sight eventually being both improved and perfectly natural.

I now myself, in these cases, always adopt the method practised and recommended by Mr Elliott, of dividing the corresponding inner straight muscle, when an inversion, however slight, is seen in either eye on looking forwards, after the division of the first.

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* Lucas, Duffin, Gutherie, Hall.

The eyes then only requiring to become accustomed to their new association or parallelism of movement, by a little side practice—he likewise observes, "the appearance is also immediately improved by rendering the eyes symetrical," though, this perhaps I should scarcely mention, as the want of symetry between the two eyes, when one only is operated on, is merely temporary.

In these cases, for the reasons already given, this continued inversion may, for the most part, be seen in the same eye when both are open, though the convergence is always mutual (see Mr. Elliott's remarks, note to page 43). I feel anxious that this treatment for cases of the present class should be clearly understood, for on it, the success of this branch of the operation clearly depends; especially, when we perceive that such eminent Surgeons as M. M. Roux and Velpeau regard, or at least did regard, the operation as unsatisfactory, and one that must soon be abandoned; an opinion shared in common with them by some of our own Surgeons—and that simply, because they had confined their operations to the inverted eye only.—Mr. P. Bennett Lucas, in his work, particularly notices these cases, in which the strabismus passed to the previously well directed eye, when this is covered—though he does not himself appear to have been aware of the proper remedy for it, or in fact that the division of the second internal muscle was no more than the second step of and dependant on the same operation as the first—and is thus described by him, under the head "Double convergent Strabismus;"—but which I consider to come with more propriety under that which has conventionally been termed, "Alternating

Strabismus" and which it is just as well to be precise about, as it is one of the varieties most frequently met with.

" This tendency of the previously well-directed eye to turn in, when the previously squinting eye becomes straight, is a circumstance of great importance to be attended to before operating, lest, when one eye was restored to a natural position the other should become inverted--this, indeed, is actually what occurs in such cases, when the previously well-directed eye has been kept long bound up, or when the inner rectus muscle of the squinting eye is divided."

Mr. Duffin gives the following rule by which to decide, whether the operation is completely performed or not: " When the operation is complete in every respect, and only *one eye is affected*, no other muscle being implicated than the adductor, the patient is wholly incapable of directing the pupil inwards beyond the axis of the orbit, either in a horizontal or in an oblique line." (p. 9.) Mr. Duffin further says (p. 66), " when an attempt is made to look at the nose, if the operation be complete, the pupil, instead of being inverted, is depressed, the eye-ball being drawn directly downwards by the action of the inferior rectus muscle."

These remarks of Mr. Duffin are very judicious as applied to many cases met with, (Miss — –) but they are not *without exceptions* very well shewn by Mr. Elliott, as mentioned at page 62 from which, as well as from my own observation, I should be inclined to think that Mr. Duffin must have been led into error by noting this in some cases, and thus making it aphorismal, without regard to the many in which, though the muscle be equally well divided (for reasons explained page 56) the eye still turns inwards, and mostly, the person can by an effort of the will turn it *slightly* inwards, the direction being either upwards or downwards. Mr. Elliott also (Lancets Sept. 19th, and October 31st, 1840.) further says, that the power of inverting the eye, though in different degrees, indisputably exists, after the division of its internal rectus, in every case on which he has operated, and in which nevertheless the strabismus was quite removed.

" Notwithstanding" says Mr. Lucas, " that the muscle be divided in the most satifactory manner, and even a portion of it cut away, the eye in many cases will be found still inverted. I have ascertained beyond all doubt, that this inversion is owing to the condition of the sub-muscular and sub-conjunctival fasciæ ; and upon freely dividing these, both upwards and downwards, with a forceps and a pair of scissors, the eye in most cases will become perfectly straight."

Now, though in Burke's case there is a *possibility* of there being some adhering bands of cellular membrane, still, until we have seen the effect of a section of the corresponding muscle of the so termed sound eye, we must remain in the dark as to the exact merits of the case :--let us hear what an able and practical writer says on this subject—" The double operation" says Mr. Elliott, (Lancet, Oct. 31, 1840.) " which was first suggested and practised by me, and which appears to me and to other practitioners here and elsewhere, who have witnessed its results in my hands, to be highly valuable on many grounds, *consists, not in two single operations on eyes equally or by turn affected while both are uncovered, but in the di-*

vision of the corresponding muscle of the second eye, when the operation on the affected eye has failed to remove its squint. It is based upon and adopted from the physiological considerations formerly hinted at, viz., the remarkable consent and consequent concurrence of both eyes in a vast majority, if not in all cases of squinting, as shewn by covering each eye in turn, and suddenly uncovering it while the other is directed forwards."*

Again, Mr. Elliott says, " I have never yet seen the division of both adductors, when it was found necessary, fail in removing the squint, if both operations were undertaken *at the same sitting.* The relapse that generally supervenes, has been perfectly removed in nearly all these cases by side practice ; and where the vision of the eyes can be made to correspond, the cure will probably be permanent, though a sufficient length of time has not yet elapsed to render it certain.

The occasional cast that is sometimes seen, weeks or even months after the operation, may be always, I believe, attributed to one of two causes, viz. either a continuance of the converging tendency, in consequence of the necessary degree of side-practice not having been resorted to with sufficient perseverance, on the part of the patient, or the difficulty of making the sight of the eyes correspond."

In conclusion, in all those cases where I have divided both adductors at the same sitting, the operation has turned out quite successful ; the eyes have generally become directly parallel, enabling the patients to look straight before them, and to the right and left.

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* These views of Mr. Elliott have been most fully borne out by experience, and the correctness of which the last case herein mentioned, viz. that of Mr. Nurhnay is a very striking illustration.

The following is an illustration of what we have before observed : that there is often a tendency in both eyes, the one to turn in while the other remains straight ; imperfect vision of one eye will operate as a cause of rendering the squint habitual in that eye, for the reason that as one eye only can be directed straight at a time it is naturally the stronger eye which is so. In this case it is to be remarked, however, that the imperfect vision is not the cause of the squint itself ; it is merely the cause of determining it to one eye rather than the other The justness of this view is illustrated by the fact, that by binding up the stronger eye and strengthening the weaker by exercise, the strabismus has shifted from this to that, from which, as well as from the power, upon closing one eye, of immediately directing and seeing with the other in its proper and natural axis, we perceive, that the sensibility of the eye itself is but slightly implicated, from want of use—for though most people who squint have more or less a defect of vision in the affected eye (as was the case in the present), this only tends to shew that the mind does not attend easily to two impressions, the one being weaker than the other ; in a short time the weaker impression is entirely neglected, and the stronger only is perceived.

We have also mentioned the necessity of always examining in the first instance, whether or not there be a tendency in the apparently sound eye to turn in, when, on account of its being covered the habitually distorted eye becomes straight (Miss—case for instance but Eason's more particularly), seeing that the section of the muscle in some cases tends only as it were to transfer the squint to the other eye, and in others, does not appear to have any effect in removing the deformity (Burke's case)* until a corresponding section of the muscle of the other eye takes place, when the two become straight (Mr. Elliott) ;† Mr. Lucas says in his work (page 48) " when one eye was restored (by operation) to a natural position, the other became inverted ; and although this is actually what occurs in such cases, when the inner rectus muscle of one eye in double convergent Strabismus is divided, yet, if the Surgeon was not aware of the fact, and did not prepare, both the patients and their friends for this consequence in the apparently sound eye, similar to that just operated upon, he would get the credit of substituting one squint for another."

The general impression induced by experience now is, that in cases of double or mixed converging strabismus, the operation on both eyes should take place at the same sitting ; again Dr. Von Ammon (of Leipsic) remarks "that he has never found the strabismus return in a high degree in cases in which both eyes were operated on at the same time, whilst he has frequently seen complete relapse when one eye only was subjected to operation.

Case vii.--John Eason Æt. 33. *Strabismus convergens commistus*, East Indian ; temperament sanguine. Turner in wood and metals ; a workman at the depôt St. Thos. Mount.

November 6th 1841.--Was admitted in hospital, with an obliquity of vision affecting both eyes, but more apparent in the right ; finds the squint very inconvenient ; it interferes with his work, obliging him to depend more immediately upon his left eye : this being rather the stronger of the two ; has worked at the depôt 7 years ; sight good in other respects ; attributes the weakness of the right eye, in part to the nature of his occupation (turning metals when at a red heat,) likewise to want of use, the right eye generally accommodating itself to the left.

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* See Mrs. Nurhnay's case further on.

† Note p. 43.

Examination.--Not hereditary ; had 3 brothers and 2 sisters, one only of the sisters squinted--same kind of squint, congenital. Both eyes are turned in, the right more so ; sees pretty well with them, either eye can be turned to the external angle, the other following its motions, but turning in proportion too much into the inner angle ; when one eye is closed, the other looks straight, its motions becoming natural, and on raising the lid of the closed eye suddenly, the pupil is seen turned in--same occurs with both.

From the foregoing it appears, that this is a case admitting of cure by operation ; it is a decided squint of the mixed kind, the right eye being of the two rather the more affected, consequently the eye to be operated on, in the first instance ; though this case will most probably require the division of the inner straight muscle of both eyes, being dependant, neither upon permanent contraction of muscular fibre, spasmodic action, or paralysis, but, upon a want of corresponding nervous energy, a want of parallelism in the axes of the eyes, and which *may* be restored by the section of the muscle of the eye apparently most affected ; but should this however not be the case, the section of both will prove sufficient to restore the balance of action, the other healthy muscles then taking the eye as it were under their controul, and naturally bringing them to their true focal distance, the most adapted to their wants.

The nature of the case having been explained to the man, and the general steps of the operation, as well as the probability that it would require to be performed successively upon both eyes--as he appeared to have fully made up his mind to submit quietly to the operation, I proceeded to perform it at 12 A. M. in the usual manner, assisted by Messrs. Thompson and Porteous, and in the presence of Colonel Ketchen, Mr. Smyth and other gentlemen, who were desirous of witnessing the operation.

The patient placed in a good light, with his left eye bandaged, was seated in a high-backed chair with his head supported by cushions and steadied against the breast of Mr. Thompson, who commanded the upper eyelid with the speculum. Mr. Porteous at the same time depressing the lower lid with his finger, a piece of lint being interposed; desiring now the patient to evert his eye as much as possible, I inserted a small sharp hook into the sclerotic, 3 lines from the inner margin of the cornea, and, having through this purchase, rotated the eye completely outwards, handed the hook to Mr. Porteous, who kept it steadied in the same position, whilst I proceeded with a pair of forceps to pinch up and divide in a perpendicular direction about 4 lines of the conjunctiva, when the tendon of the internal straight muscle was brought into view, under which, a small blunt hook was passed and the tendon being raised from the sclerotica, it was immediately divided with a pair of curved scissors. The hook was now removed and the eyelids allowed to close; the operation being finished. On re-opening the eye, the pupil was seen perfectly straight, neither had he the power to turn the eye in, when desired to do so, the left eye now appeared the one particularly turned in; this however, was no more than we had anticipated, and the patient prepared for. As he had borne the operation remarkably well, not having flinched, or uttered a word, and as he was neither weak or nervous, and appeared anxious that I should proceed with the other eye: after he had taken a little wine and water, I commenced in the same manner on the left eye: the right being bandaged; Messrs. Thompson and Porteous simply exchanging duties.—This part of the operation was conducted in the same manner as the first, there was a little delay from the light not being quite so good, and the ball of the eye being allowed to liberate itself from the sharp hook which Mr. Thompson held—the eye being immediately drawn upwards, under the eyelid, by the action of the involuntary muscles;—however this was immediately attended to, and the operation finished most satisfactorily. When the eyelids were re-opened the pupil was found perfectly centrical, neither had he now the power of turning this eye inwards: in fact both pupils now appeared quite centrical, they could not be turned in, and the man saw straight. He immediately exclaimed "now I can see very well--now I can see all about me with both eyes—I find this eye (alluding to the right) now as good as the other."

Evening.—Does not feel the least pain in the eyes

--both now appear quite straight same as they appeared immediately after the operation. Had an aperient powder, and a saline Draught, to allay and prevent any febrile irritation that would be likely to arise from the nervous excitement of the morning, as well as the mechanical injury itself offered to the eye – Though I have not in the majority of cases attended to this step, still I should be inclined to view it in the light of a precaution, which, though it be not actually necessary, is nevertheless to be commended--Upon the old adage that, " Prevention is better than cure."

November 7th.--No pain whatever in the eyes.—says he now feels both move together, which they did not before : as he mostly viewed objects with the left eye--the right being turned towards the nose, and not cognizant of them. There is at present an appearance of the left eye being *slightly* turned in, this led Mr. Smyth to observe, that perhaps a few of the muscular fibres might have been left undivided, this, certainly might possibly have been the case--though to myself and those immediately assisting in the operation, the whole of the tendon appeared to have been most satisfactorily divided, as the exposed surface of the sclerotica warranted--nor could there be felt upon the hook being passed over its surface upwards and downwards any adhering bands of cellular membrane--I am therefore inclined to attribute it rather to a contraction and puckering of the cellular membrane itself and superincumbent conjunctiva, during the process of cicatrization, and which will in the course of a few days as it further progresses give rise to granulation--this being always more or less the case where the conjunctiva and cellular membrane are not so clearly divided; and this was rather the case in the left eye—the light not being quite so good—the operation itself being a trifle longer.

November 8th.—No pain now in his right eye, but the conjunctiva still looks highly vascular:—can, when the eye is uncovered, see perfectly well—scarcely any vascularity comparatively speaking in the left.

November 9th.—Does not complain of any pain in his eyes—sees perfectly well—but there is still a considerable ecchymosis of the right eye—there appears a *very slight* tendancy inwards of the left eye (the one that was the least affected before the operation): I have therefore desired him to practice looking to the left.

Nov. 12th.—Feels very comfortable—expresses himself much pleased—no pain—can now see quite parallel in all directions:—says, before he commenced this side practice recommended, could not turn the left eye out so much or see with it so well—not the least converging now of the left eye inwards.

Discharged, perfectly cured.

There is a most important and distinguishing character in connection with, and succeeding to each of these Operations, and which has been noticed by every practical writer on the subject. I allude to *an apparent enlargement and prominence* of the eyeball, which is said always to take place, more or less, upon division of the inner straight muscle in *converging Strabismus*, and upon which Mr. Lucas remarks (p. 53.) "if the eyes are naturally sunken, the eye operated on contrasts much with the sound one, which remains sunk; the effect of which on the whole physiognomy is very striking." And further adds "for the mere purpose of rendering the sunken eye, which did not squint prominent like its fellow which had been subjected to operation, I have in like manner divided its inner straight muscle, with the most satisfactory results."

Dr. F. A. Von Ammon (of Leipsic) says "that the prominence of the eye is much more considerable after division of the inner, than of the outer straight muscle. Mr. Duffin (p. 22.) conceives that the increased prominence of the eye-ball after operation, depends very much on a too free incision of the conjunctiva, and dissection of parts from over the surface of the sclerotica during operation;" this, is also an opinion entertained in common with him by many others.—I must express however some surprise that the reverse of this, or an apparent contraction or smallness of the eye after the operation, has not attracted their attention; in my own practice, I have found the latter to occur fully as frequently as the former, and much doubt whether this is in the least to be attributed to a freer division of the conjunctiva than is absolutely necessary—as, I myself have at times, operated more neatly and quickly than at others, making the incisions more, or less, according to the accidental circumstances of the case; still I have not found this, as I before observed, affect the eye, either as to prominence, or retraction—experience has also led me to expect an apparent retraction or smallness of the eye following division of the external rectus. These facts are necessary to be borne in mind, and in making them known to the relatives or friends of the patient, it is better to state the liability, either to a slight prominence or retraction of the eye or eyes for a few days, as a consequence following the operation, and thereby prevent any thing like disappointment being felt by them afterwards:though the operation itself be as well performed as could be desired ; for in this respect there is no certainty, except its being a passing occurrence ;—for instance, in the ten or eleven cases I have performed in this country they have mostly been smaller, whilst in the first operation I performed in England (George Britchfield) as well as in many others, there was a decided though slight prominence for a few days afterwards. The blood-shot appearance of the eye operated on, which always takes place to a greater or less degree, should also for the same reason be mentioned to the relatives and parties themselves.

In patients labouring under Strabismus Convergens the eye-balls generally speaking are large and full, and in the cases of divergent Strabismus which have more immediately come under my notice they have been apparently rather smaller, though these remarks I consider as more strictly applicable to Europeans, for in truth in the few opportunities I have yet had of examining the native eye, it has in every case appeared smaller whether the squint were divergent or convergent ; and in like manner the eye in them immediately after either operation, retracted or becomes as it were less in size ;--though this passes off in a few days.

The following remarks and cases by F.H. **Brett**, **Esq.** Superintendant of the Calcutta Eye Infirmary, with their accompanying Lithograph, will doubtless in connection with the present operation prove interesting to such as have not had an opportunity of perusing them in the undermentioned Journal—April 1st 1841.

Superintendant of the Eye Infirmary.

To the Editor of the India Journal of Medical and Physical Science.

Sir,—Some points of Practical Importance appear to be deserving of the attention of my Professional brethren who may have occasion to perform this operation for the removal of the very unsightly deformity of Strabismus. From the three operations I have had occasion to perform during the month, it has proved to be attended with no danger, and provided due precautions are used, the pain is trifling and soon over, and it is very gratifying to see the eye instantaneously return to its proper axis.

The following rules appear to be worthy of notice.

1st. The hook must be made to penetrate the Tunica Albugenia at the point indicated in the figure. An intelligent assistant with a delicate touch and steady hand carefully rotates the eye outwards in the horizontal line, if he gives it the least obliquity he disconcerts the operator in his search after the rectus muscle which he has to divide, and he finds it either above or below where he expects it.

2nd. The Assistant who has charge of the speculum for raising the lid will be less liable to let it slip by wrapping round it a piece of lint.

3rd. The operator requires nothing more than a pair of Forceps,, curved scissors, and a silver probe: pinching up a portion of Conjunctiva with the forceps, midway between the insersion of the hook, and similunar fold (in the case of internal strabismus): the eye being rotated outwards as in Figure 1, the Surgeon with the scissors cuts through the Conjunctiva upwards and downwards (see the first Figure): he then detaches the loose cellular membrane, aud exposes the tendon of the internal rectus. The pointed scissors are carried nearly parallel with the ball of the eye, and the muscle is freely divided. There is no fear of the under blade of the scissors penetrating the sclerotic coat, and the operator is sure that he has divided *every fibre* of the muscle, by seeing the *bluish white Sclerotica* underneath as he cuts along. The feeling of the hard sclerotic coat is distinctly communicated to the touch.

Case 1st.—Baboo Juddoonautha Dey, squinted from birth; one third of the Cornea was concealed behind the inner Canthus; he paid no attention to the impression of light on the eye, as is usually the case with those who squint. The eye in fact was useless—on the 6th of March the operation was performed. The eye instantly became straight. Cold applications, an alterative dose of medicine, and a Collyrium (eye wash) of Alum, were prescribed. He has now not the slightest vestige of squint in the eye.

Case 2nd.—Thos. Clarke Graham, had strabismus from infancy. The left eye was distorted inwards very *much*. He could not see with the eye from the excessive squint. The operation was performed on the 13th March. The globe instantly rolled into the axis of Vision; he observed "I can now see quite distinctly with the eye." 14th slight chemosis but no inflammation.

16th. has still slight chemosis : complains of no pain ; let him take a couple of aperient pills at night and a little oil in the morning—apply a leech to the lower eye lid,

18th Let him use the Alum Lotion to the eye.

23rd Removed a granulation from the eye.

24th The Chemosis gone, and the patient doing well.

Case the 3rd Miss ——Æt. 18. The strabismus of the left eye was very marked, and indeed sadly injured her appearance, the result of the operation was equally marked. The eye became quite straight—she observed, " I now prefer looking with this eye" her appearance is now really interesting and pretty.

The eye should be covered with wetted lint for a few days. It is generally necessary to remove a small fleshy granulation by excision, or by the application of the nitrate of silver (lunar caustic). Astringent Lotions afterwards employed.

Neither of these patients have the slightest vestige of squint inwards in the eyes operated on, neither is the eye-ball turned unduly outwards by the antagonist muscle. It appears that the three remaining recti (straight muscles), which all proceed from the back of the orbit a little obliquely forward, together with the superior and inferior oblique, harmonize in their combined action, and balance the eye in its proper axis."

These three as we perceive, are cases of the simple " Strabismus Convergens" or inward squint : the only case of which kind that I make mention, is that of Wm. Britchfield p. 55 ; for the cases I have mostly met with have been either of a Double Alternating, " or Divergent" nature ; though this latter squint, whether or not it be the most forbidding, is certainly the most rarely met with. From my own experience I should say (in England at least), that it did not occur on an average, in more than one case out of ten, or perhaps I should be nearer the truth in saying, one case out of fifteen ; and as for the comparative case of the operation in the opposite cases, I myself have not perceived any difference.*

The following operations which I have performed since the above was sent to press, are of so interesting a character as illustrating the correctness of the principles herein enforced, that I will give them with the few concluding observations they call for, in a sufficiently condensed form, so as not to tire ; though still as reference for future guidance in cases of a similar nature, to prove of some practical utility.

Case viii. Mixed convergent, or Alternating Strabismus.—Wednesday Decr. 15th Mr. John Anderson, Veterinarian at Mr. Taylors Stables, labouring under this affection, waited on me at the Mount to ascertain my opinion on his case : as he was desirous of undergoing the operation for its removal, should I deem it advisable.

Has squinted from birth—The right eye is the one usually affected—turns completely into the inner angle—sight of this eye (in which there is incipient cataract[*]) much weaker than the left—upon closing the sound (left) eye, the affected eye immediately becomes straight: but upon suddenly raising the lid of the left eye, it is seen turned in; the right eye however quickly resumes its former converged position. As the right eye is the most, and under ordinary circumstances the decidedly affected eye, there is great probability that the operation on it alone will prove sufficient to restore the parallelism of both. This I mentioned to him, at the same time however stating, there was the liability that a corresponding operation might be required on the apparently sound eye, and which, should this be the case, I would proceed with at the same sitting.—Having thus ascertained the nature and fitness of the case, I appointed to be in Town on the Friday following, when, with the kind and able assistance of my friend A. C. MacLeod, Esq. I proceeded to perform the operation in the usual manner, and with the most gratifying success: the eyes immediately becoming parallel; the operation on one eye only having been as anticipated, necessary. Did not offer any resistance, neither did he complain of pain from the operation itself—for in fact he remarked that he had not felt the division of the muscle, the only pain that he experienced during the operation, was that arising from pressure over the eyebrew, the finger or speculum having by chance rested for a few seconds upon the supra-orbitar nerve : this pain he continued to feel more or less for two days after.*

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* With respect to external squint, or divergent strabismus, this is much less frequently met with than the convergent variety. In the normal state, the power which tends to draw the eye inwards is greater than that in the opposite direction. Not only the internal rectus, but most probably both the oblique muscles, tend to bring the eye towards the inner canthus ; and it is likely that the greater frequency of internal strabismus is owing to the preponderating power in that direction."
—J. Walker, Lancet Aug. 7th 1841.

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[*] I have obseeved that very frequently the affected eye is the seat of incipient cataract, this does not in the least militate against the operation, but the reverse: for the operation by restoring the eye to its natural axis, and thus bringing it into equal use with the other, strengthens, and thereby may be a most effectual means of checking or retarding its formation.

There was the usual ecchymosis, and the case progressed much in the ordinary manner : though the cure was retarded by a troublesome cough with which he at the time was affected,† giving rise to a pretty free granulation, which required to be removed upon two successive occasions : after which as the cough (for which he was treated) ceased, so did the tendancy in the conjunctiva to re-granulate. The usual effect of the operation, double vision, was also present, and continued for a short time. The patient in this instance, laboured under the disadvantage of his avocations which did not permit him that rest and quiet, as well, as that carefulness to guard against the light, for a few days subsequent to the operation, which as every person must be aware, is so essentially necessary to ensure a speedy and easy recovery ; and to the want of which attention, and not to the operation itself, (which is harmless) are any unpleasant consequences that may arise, to be attributed.

Case ix. Strabismus Convergens, Commistus.—Monday, Dec. 20th operated in the case of a Native Hindoo lad, of good family, named Subawbedee Æt. 16, for the removal of a double convergent mixed (alternating) squint. In this case either eye was turned in indifferently, (in which it decidedly differed from the preceding), but only one eye at a time was converged, excepting when looking fixedly at an object directly before him, and not above three or four feet off, when both eyes would appear most decidedly converged. Has squinted from birth, when one eye is closed, the other becomes straight, same occurs with both eyes, the right eye also appears to have a very slight nebulous tinge, there is likewise less distinctless of vision in the right eye, to which if there could be said to be any difference, the squint appears to be most inclined.

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* See Britchfields case p. 57.

† When there is cough present, it is advisable to delay the operation a few days, until it be in the first instance removed.

This case of course, I had no hesitation in pronouncing would require the operation on both eyes; though provided the operation was well conducted, it would be attended by full and permanent success.

Having in the first instance, ascertained the lads steadiness a day or two previously with the speculum, and thus prepared him for the steps of the operation :[*] as he was still very desirous of being relieved from the deformity, and did not shew the least fear, I now proceeded with the kind assistance of S. Rogers, Esq. to operate in the usual manner. The lad bore it astonishingly well, not saying a word—it was performed satisfactorily, and in about a minute.—Immediately upon re-opening the eye, it was found perfectly straight, and he had lost for the time all power of turning it in. The right eye was now found the affected one (this is very frequently the case, though not always[†]) the corresponding muscle of which was immediately divided, and the lad was sent home, with the happy prospect of looking his neighbours straight in the face, for the rest of his days.

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[*] This is not only when thus ascertained more satisfactory, but it is even essentially necessary to avoid disappointment to all parties, as some patients *cannot* however desirous, bear even the application of the speculum, or in fact the application of *any* instrument to the eye, without becoming so unsteady, as to preclude the possibility of proceeding.—See case P. 54.

[†] In fact after the division of the muscle of one eye, sometimes the two become dilrectly parallel (I. Andersons case) ; at others the undivided eye turns more inwards; again the divided eye occasion-

I had scarcely anticipated from the native character in general, that the lad would have proved so collected during the operation, not offering the least opposition; he only slightly demurred to the second operation being performed at the same sitting: wishing that it might be delayed, until the first had healed; however, this was easily overruled, and he submitted as patiently and quietly to the second, as he had done to the first. After operation the eye in the second instance could be turned in, which in the first was not the case: the muscle was nevertheless as *perfectly* divided in the latter as in the former: for upon refixing the eye to avoid any doubt upon the subject, it was perfectly satisfactory both to Mr. Rogers and myself, that there were no connecting bands remaining, and that if this action be not actually owing to non-division of the Tunica Vaginalis oculi, it must be dependant upon the superior and inferior recti. Whatever reasons however may be assigned for it, we perceive from this, as well as from the following case, (shewing if it can be plainer still,) the truth of that which has already been insisted

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ally turns more in than before, the other eye becoming straight; (Mrs. Nurhnay's case)—and sometimes the divided eye (as in the present instance) becomes straight, and the other simply becomes permanently affected in lieu of it, and to a corresponding extent; as shewn before the operation, by closing the eyes alternately. Again, occasionally, we find that the one becomes straight, but there is still a slight cast remaining in the other; (Miss——case)—these different effects, being dependant simply, upon the extent to which the want of nervous parallelism between the eyes manifests itself in these respective cases.

upon (p. p. 62. 68.) viz.—that the power to invert the eye after operation, can only be taken as a negative sign of success - if the eye *cannot* be turned in, of course it is sufficiently clear the muscle *is* divided ; but if it *does* turn in, it is not so clear, that it follows of course, as some good folks have it, that the muscle is *not* divided ; for, as we perceive, the very reverse may be the case.*

Cold water was as usual applied to the eyes.

Report, five days after operation, says—ecchymosis much less—no pain—eyes perfectly straight—a granulation forming in the right eye ; the left is quite smooth—touched the granulation with caustic.

Six weeks after operation—Not the slightest vestige remaining to shew that the lad had ever squinted.

Case X.—Monday, Decr. 27th - Mrs. Nurhnay, Ætat. 50, Widow of the late Serjt. Major of H. Artillery—Double convergent, or mixed squint—she is the only one that squints out of a family of five ; neither are any of her children, or grand children thus in the least affected—This is a case exactly parallel to the preceding—says she recollects its coming on, when about five years of age—does not know what from, but attributes it " to having been brought up in a room in which were several windows, the light from which confused her sight"—was much worse some years ago—is sufficiently unpleasant to her now, to make her highly desirous of submitting to any operation that will effectually remove it—Having intimated to her the great probability that the operation would be required upon both eyes successively—and my intention to perform the double operation should it be necessary, at the same sitting—I proceeded in the usual manner, and with the kind assistance, of S. Rogers, and J. Hamlyn Esqrs., to operate upon the left eye, in the first instance ; Dr. Lorimer, and Lt. O'Bryan, being present. There was in this instance a delay and some demurring previous to operation, owing to the good lady's nervous system being unusually out of order, this was however speedily remedied by a draught of, wine and water—and the operation proceeded with ; it occupied about a minute, and was concluded successfully in spite of great spasm of the orbicularis, and a corresponding uusteadiness of the patient. However though it was successfully performed as regards the actual division of the muscle, (which was apparent to all) still upon re-opening the eye it was perceived equally turned in, or nearly so, to before the operation : in fact it appeared to me to be rather more so, and this as my opinion I mentioned to the patient, desiring her to see the glass, and judge for herself ; however in mentioning this to her, I likewise mentioned, that this effect of the operation, which was not unusual, should not cause her any alarm or discouragement : for that if she would quietly resume her seat and allow me to conclude the operation, (of which she had only submitted to the first part) by proceeding in like manner with the right eye, the effect of the double operation would be immediately to restore the apparent parallelism of both eyes.

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* See note p. 43. Mr. Elliott's remarks on a case, where he states "Though the person still squints, the effect of the division of the adductor of the straight eye was greater on the inverted one, than the division of its own adductor." On this subject, Mr. John Walker of Manchester, in the Lancet for Aug. 7th 1841 says ; "When successful in removing the squint, the division of the internal rectus muscle does not prevent all motion of the eye inwards,—it only diminishes that inordinate action which causes it to be impelled in that direction when removed from the immediate controul of the will. Hence we presume that some other power enables the organ to move in that direction after the division of the internal rectus. That power must be supposed to be in the supr. oblique muscle ; and we find that Dieffenbach, and some others, after ineffectually cutting across the internal rectus, have removed the distortion of the eye by the division of the trochlearis."

This was rather a difficult point to make the good lady understand : for the right eye had now assumed a perfectly straight position, and she naturally enough said " why if you serve my straight eye in the same way as you have done to the other, that also will turn in, and I am afraid I shall loose my sight." However as it was sufficiently evident to all present, that the muscle had been cleanly divided, and that no cellular bands, or other attachments retained it in its present position, it evidently depended upon a want of nervous parallelism, (so clearly illustrated in Mr. Elliott's remarks upon similar cases*) the right eye now having a very undue influence, and nervous power over the left, and which, a section of the corresponding muscle of the right eye would restore, by equalizing the balance of nervous action.

After some time, and much persuasion, she consented to venture her straight eye under my hands— the operation was speedily performed, and on re-opening her eyes they were both perfectly straight : the good lady was satisfied : and I was pleased she had thus afforded me an opportunity of clearing the operation itself from any obliquy which the apparent failure in this case would have entailed upon it, instead of as it should, upon the unreasonable individual that might self-willfully occasion it. It further enabled me to show the principle borne in view in these pages : and which, led me not to interfere further with the eye operated on, but immediately to divide the muscle of the then perfectly straight eye; and as we see the effect was conclusive.

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* As instanced in the preceding note p. 43.

Cold alum water was applied to the eyes.

Report, four days after operation—eyes perfectly straight—very little ecchymosis—no pain, or puckering of the conjunctiva, which is quite smooth—the mark of a clean incision through it being the only perceptible *remains of the operation*, and this only, upon desiring her to rotate the eye completely outwards.

As the case was apparently progressing so very favourably, I did not consider it necessary to call again till the 5th of January, being nine days from the operation: when to my great annoyance I perceived that there was a decided though slight re-convergence of the right eye; the effect of this unusually speedy re-adhesion of the incised parts; the muscle having reunited anterior to the transverse diameter of the ball.* The wound had reunited too early—too easily—too quickly—nature had in fact in this instance been too kind—and thus by too speedily restoring the parts to their original state, also in some measure restored the deformity. This is dependant upon a peculiar idiosyncrasy—a healthy constitutional tendency—*vulgo*, a healthy state of the flesh—in which, even severe incised wounds heal without trouble, or constitutional irritation, by the first intention; and to which is opposed that state of the body, or as it is commonly called that unhealthy state of the flesh, in which the slightest incised wound or merest scratch, proves not only troublesome and slow of healing, but in vulgar parlance, festers. Now these are casualties perfectly independent of the operation, and which as we cannot foresee, so likewise we cannot controul : and the remedy for which, is simply, a repetition of the operation ; taking care in this instance, not to make a clean cut wound of it, lest the parts if they be not sufficiently disturbed, again reunite too readily in their old places; the object now being to disturb the parts more, and even, with a blunt probe, push back the posterior potion of the divided muscle. Mr. Duffin in his work, recommends as a general practice, the excision of a portion of the muscle : this I have never yet found necessary ; but I must suppose it was in allusion to some such case as the present, that he was induced to make this observation.

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* See remarks by Mr. Lucas, p.

The good lady with all her nervousness, (as she owned that the pain of the operation was in a great measure imaginary,)* would readily have re-submitted to it ; and even appointed a day for that purpose ; but was subsequently forced to defer it, as she could not possibly give to it the requisite attention and delay, being at the time busily engaged in the necessary preparations for her departure to England with her family, on the 25th of this Month.

I have lately been consulted in many other cases, some of which I purpose performing in the course of a few days ; some again are pendant upon the voice of others : and therefore appear to require consideration–one lady was known to throw doubts upon the operation as respected her husband (whose squint was *beyond a doubt*,) by seriously enquiring whether it were possible for the Dr. to spoil his beauty—upon which she was as gravely answered, that, that, was a doubtful point ; upon which she wisely said, "she would consider about it"—and I have never heard of the case since.

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* Mrs. Nurhnay was evidently more frightened than hurt : as she now freely owns : what upset her equanimity, was the sight of the wire speculum (used to support the upper eyelid), I had omitted (not having it by me at the time) making her practically acquainted with its use, either by trying it on her, or applying it to my own eye,—a practice I now always adopt, on some occasion previous to the operation : as it gives confidence, and ensures the steadiness of the patient ; thereby preventing a recurrence of a similar case to that mentioned p. 54. The pain she suffered certainly was trifling, and caused most probably, as it was apparently, by the spasmodic efforts, made by the ball to relieve itself, as well as by the violent spasmodic efforts made by the orbicularis to close the eye : so much so, as to produce complete eversion of both lids.

In all these cases above detailed, there was more or less indistinctness of, or double vision, following as a temporary consequence of the operation : (owing to the before-mentioned causes) the shade of any object looked at, appearing on one side of it ; this result being the same in each case ; though as we perceive in Anderson's case, but one eye was operated on : while, in the two latter, both ; still all complained of the same effects. In Anderson's case a shadow as it were of the object, appeared on the right of the object looked at : (his right eye was operated on) of course to the left of himself ; this, however, is no more than we should expect, and be led to suppose from the well known manner in which the rays of light proceeding to the optic axes, traverse, or as it were bisect each other ; the right looking left, and the left right.

Anderson's case, further, sufficiently illustrates a principle of this operation before alluded to ; viz., That the operation on one eye is generally sufficient, even in cases of mixed double, or alternating squint, when a decided preferance is shewn for the one, and the squint is as it were constant to that eye, excepting when drawn from the one to the other : (as experimentally shewn by the alternate closing of the eyes, and subsequent raising of the lid,) the squinting eye being liberated only during the closure of the other ; the section in these cases of the muscle of the more affected eye, breaks through the morbid chain of action, which exists in relation with, and thus influences the corresponding motion of the eyes ; a fact, with which, if not previously made acquainted, naturally enough is very apt to occasion surprize to persons first directing their attention to the subject ; but which, we perceive is a natural effect, and admits of a very ready explanation. See note p.

Again, it is not astonishing that some should, from a want of sufficient experience in the operation, have fallen into the common and natural error of supposing that the inability to turn the eye inwards after a section of the inner straight muscle, the only *certain* test in *all cases*, of the muscle having been fully divided : this, however, has been *proved* not to be the case ; on this subject see remarks by Mr. Elliott of Carlisle, (Lancet, Oct. 31st, 1840.) " If the patient is unable to invert the eye beyond the centre of the orbit : the operation it complete as regards that eye ; and this has been mentioned by different authors as the only test of the operation having been perfectly performed. In the great majority of cases, I have found however that the eye could be inverted considerably beyond this point : but not so as to conceal all the white of the eye on the inner margin of the cornea, though the complete division of the tendon and cellular tissue connecting the muscle to the ball, was proved in some of these cases, by the clear exposure of the inner surface of the globe, and in all by a careful search with the blunt hook." However, that the eye can as I have before explained be turned inwards after *complete* section of the tendon, adherent cellular membrane &c. was most satisfactorily shewn to all present, in the case of Mrs. Nurhnay ; in whom, as we perceive, the equilibrium of the eyes was restored, not by the division of the muscle of the affected (most affected) eye, but by the division of the corresponding muscle of the then straight, and apparently sound eye. Had I here acted upon the principle that some have advocated, (without a sufficient experience upon the subject,) viz. " That when after division of the muscle, the eye can be turned in the direction of the squint, however slightly, (in this case it was turned in as much as before division of the muscle) we must proceed unhesitatingly to the division of either, the superior oblique, or a portion of the upper or lower straight muscles ;" what a pretty job I should have made of it ; the poor woman no doubt would have *recollected* me, but not with the feelings of gratitude which under present circumstances, I flatter myself she will. It would have been a case parallel to that of poor Mr. G. p. 44. to which as it directly bears upon the point, I beg to refer the reader.

It will be seen by reference to the Lithograph Plate vi. and preceding cases of Mr. Brett, as well as from the cases and remarks of Dr. Lane (whose skill and abilities have in this Presidency justly ranked him as the first Oculist of the day) that we each individually, adopt as nearly as may be the same steps in this operation—the simplicity and ease of which is its greatest recommendation—I will further take the opportunity, of remarking, that this was the method pursued when I left England in April 1841, by Messrs. P. Bennett Lucas,* Elliott of Carlisle, and many other well known surgeons, eminent for their skill and success in the performance of this operation, and in whose steps I only follow. I am induced to make these remarks and quote the above authority, lest a person first attempting the operation, should in the midst of the variety of dissimilar methods mentioned in many of the Periodicals, and each equally recommended by its advocates be at a loss for a preference—thus proving rather a source of annoyance instead of a guide, when the occasion presented ; however, as the muscle can be effectually divided in various ways, it will depend more upon the fancy, or taste, not to say judgment of the operator : for as we perceive, the greater number of writers on this subject, have turned their attention more to the newly discovered Instruments and modes of operating, than to the physiology of the operation itself—bearing in mind that the perfection and true surgical performance of an operation does not consist in using this or that instrument, a knife or a pair of scissors, a sharp hook or no hook at all, but in the celerity of the performance, and more, in ensuring its ultimate success : not forgetting the patient's feelings : these affording us the only criterion we have to judge by ; "Au reste," the means used to attain these desirable ends, being at the option or judgment of the operator.

Moreover, the blunt hook also, has come in for its share of captious censure. I must beg however to defer to the opinion of Mr. P. Bennett Lucas on this subject,* and until I see further and better reason to change my opinion, I shall still give a preference to the hook and scissors, instead of the knives: and did I use a knife at all, I should still use a blunt hook to raise the tendon. Any person perusing the operation on the maty, will scarcely be of opinion that it requires to be more simplified, especially, at the risk of a doubtful success; for by first raising the muscle on the blunt hook, and passing one of the curved blades of the scissors underneath it, there is a *certainty* of having fully divided the tendon easily and completely, which certainly cannot be said of the knives *generally.* Too much is also often attempted, probably with the idea to save time or trouble, or perhaps for *shew.* The sharp hook is first dispensed with, and after the conjunctiva has been divided with a sharp straight point-knife, a curvéd blunt-pointed bistuary is made to answer the double purpose, of a blunt hook, to raise up the tendon in the first instance, and then of a knife to divide it, but neither of which ends it either easily or effectually answers, but the reverse;† *it is by itself* an uncertain instrument: assisted by the blunt hook, it then becomes a very proper one, and one that will answer the purpose intended as well as either scissors or any other form of knife which the next fanciful operator may invent; *used in this manner* I have frequently tried it, last, as mentioned in the 2nd operation on Miss — , but on the whole prefer the scissors; were it only out of regard to the patient's feelings. (see Miss — case p. 59.)

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* The gentleman who first introduced this operation into England.

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* Mr. P. Bennett Lucas in his work on the abandonment of the sharp hook noticed in the Lancet for August 1840 says "the latter instrument (forceps) I have since found is not for many reasons to be depended upon as much as the hook, it gives more uneasiness to the patient and is apt to loose its hold of the conjunctiva, which the hook never does, until it is intentionally removed."

† The operator always has a sharp pointed bistuary at hand, which is often required to be used to complete the work of the blunt pointed one: so that in fact when conducted in this manner, three knives are frequently used instead of a pair of scissors, under the impression that by using one knife only, it would shew a greater degree of dexterity and give to the operation a more off-hand or finished appearance. This, however, cannot be in truth said in praise of such a mode of proceeding as it certainly would be a very singular not to say original recommendation; for if it is not, either so easy or so simple of performance: it is certain-

Those who fancy that they have either improved or simplified the operation, by dispensing with the small sharp hook I make use of (to steady the eye when rotated outwards), are labouring under a very grand mistake, which a little more experience will tend to remove: in truth they are thereby turning an exceedingly simple operation, into a very complicated and unsatisfactory one; for by not using this instrument, the operator has neither command over the eye, field for observation, or a sufficient space to operate in; and as for desiring the patient to look outwards, when, from the very nervousness in which his situation places him, the eye has a greater tendency than ever to turn inwards: it is really more than can be expected even from the most accommodating patients; you may desire them to look outwards as much as you will, but

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ly therefore not to be recommended—for it is well known, that, the ease and simplicity of an operation, constitutes its perfection—and not the Hectoral slap-dash method of performing (at the emminent hazard of the patients eye, and the Surgeons reputation,) which, so far from being so satisfactory or quickly performed; I have *seen* to be the reverse—It is easy for any one to take up his pen and write so and so is the case—but, this dictatorial method, will not, certainly as respects either medicine or surgery conclusively establish the point in any liberal mind, though never so much inclined to put faith in the wisdom of a name; unless indeed it be also supported by the histories of such cases, proving their *having been* performed *thus*, either with greater dexterity or tact, to say nothing of *time*.

this it is not in their power to do, that is, long together for immediately any instrument is felt in the inner angle, (or in fact any where else) the involuntary muscles act, and there is an effort made to close the eyelids, which was beautifully shewn in one of my operations, (see Eason's case) from the hook slipping. It will also be perceived both from my cases as well as those related by Mr. Brett, that but a very trifling hæmorrage, if it deserves the name, occurs in this operation; less so in fact than we might naturally enough expect would be the case—and unless there be unnecessary hacking of the Conjunctiva, an exceedingly plethoric subject, or much resistance, this seldom amounts to more than a few drops of blood, which oose out of the inner angle of the eye.

The introduction of the hook, also the division of the muscle, naturally enough causes *some* pain - but this Mr. Brett observes "provided due precautions are used, is trifling and soon over." Mr. Brett operates with the scissors - so does Dr. Lane—I myself believe that the operation performed with the scissors, occasions much less pain; the patients (and they should be the best judges) at least express themselves to that effect.

The spontaneous expression of three or four of my patients, was, that they did not actually feel *any* pain,* during the division of the tendon; nor is this so much to be wondered at, when we reflect on the little sensibility inherent in a healthy tendon: sufficiently observeable and known to all who have either seen, or performed the operation for the division of the Ham-string muscles, in contraction of the knee; or, of the Tendo

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* See case. Miss — p. 59.—The Native lad, Subawbedee (case p. 84.) did not complain of any pain, neither was there spasm of the lid; and the same may be said with respect to John Eason. (Case p. 72.)

Achilles, in Club-foot. The pain in the present operation (at least conducted as I mention) I have no hesitation in saying (and we cannot judge better than from the after expressions of the patients themselves,) is, in a very great measure mental.;—that is dependant upon the nervous state of excitement into which the patient is thrown by the bare idea of an operation : to say nothing of one to be performed on an organ so extremely delicate and sensible as the eye even in its natural and healthy state is commonly, though erroneously, supposed to be. The chief physical pain depends in fact on the spasmodic efforts to close the eyes, being met by a corresponding opposing force on the part of the assistant's fingers, or the speculum,* by which more or less pressure is made upon the ball ; and also for the instant on the insertion of the sharp hook, and its retaining the eye in the given direction, against the natural efforts made to draw it contrary-wise. However, the pain is after all but trifling, whatever caused by, and very much less than any patient I have had, anticipated.

Now with regard to the *ultimate success* of the operation, this is a point which till lately has admitted of some dispute. The results according to the statement of different individuals, being most opposite : and so conflicting are they in this respect, that it would from them appear extremely difficult to come to any satisfactory conclusion ; seeing that in some countries it has met with great success, and the reverse in others. *Dieffenbach* tells us that he has succeeded in every case; and M. Van Roosbroeck boasts in Belgium of having operated on 180 persons with complete success. In France (though the dexterity of her Surgeons cannot be questioned by any one) they appear to have been much less fortunate; for says M. Carron du Villards (Bulletin de Therapeutique, August, 1840.) " we have given the operation a fair trial, but hitherto no surgeon of good faith will pronounce the operation to be " un moyen curatif constant." Nor do the french surgeons in their writings appear to be so unanimous, respecting the advantages of the new operation for the relief of this infirmity, as prevails among the numerous correspondents on the subject in the English periodicals. Hence it has by many been feared, the announcements of the almost uniform success which has attended our operations on these muscles, in the many hundred cases reported, have been rather premature; and which directly gives rise to the important question: have they been permanent? for say they: it can readily be supposed that the eye may recover a straight direction at the moment, and for some time after the operation; but forsooth the obliquity may also probably return when the cicatrization has been completely effected. *Allowing* this view of the case: the patient has the satisfaction of knowing by the end of the month whether or not the cure be permament; for so far from getting worse, they from that time forward cannot fail, from mere unison of practice, to become more intimately assimilated in their every movement: the sight of course improving.

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* Mr. John Anderson (see case p. 83.) did not complain of any pain or say a word during the performance of the operation ; but immediately afterwards expressed himself to the effect, that the only pain he experienced, was from the pressure of the speculum on the upper part of the orbit. It so chanced in fact, that the speculum or finger had rested for a few seconds on the supra-orbitar nerve ; (this we find was likewise, the chief pain complained of in the case of Geo. Britchfield p. 57) slight pain continued to be felt in the part for a couple of days afterwards.

It is undoubtedly a great error in surgery to apply a single and exclusive practice to the treatment of a deformity of which there are numerous and different forms; certainly, if squinting was invariably owing to a permanent shortening of one or more muscles of the eye, the division of the affected muscle or muscles, might be followed by success in the majority of cases; but unfortunately such is not so, and the deformity is often attributable to conditions in which such an operation is utterly inapplicable:* though I certainly do not hold with the opinion of M. Venier, (Gazette des Hopitaux, 1840.) That the only form of squinting which we can reasonably hope to remove by the operation is that which is permanent, and is caused by the ex-cess of action, or a deficiency in the length of that muscle, in the direction of which, the deviation is present :—for this is indeed in direct contradiction to what experience proves to be the case : as we perceive from what has been mentioned of the double operation, performed upon cases of the double convergent kind : dependent, evidently upon sympathetic action, and not certainly upon either permanent shortening, or a deficiency, in the length of the muscle. But, whether this be correct or not, most persons will be ready to admit that time and experience have fully shewn the great benefit of this operation, when conducted with care in such cases as admit of being remedied by it; and we may reasonably ascribe much of the obloquy against it, to that folly of competition which has induced otherwise sensible men to undertake, with a somewhat vehement readiness, every case of squinting indiscriminately :* as well as in a want of that practical knowledge of the principles, and the results arising from the operation, which should guide us in its performance: and which, time, by shewing us the hasty errors of our former cases, has enabled us to improve upon in our latter.—I consider the operation to be now reduced to a certainty ; but only in such cases as should be undertaken at all.

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* We have at the Mount a singularly interesting and decided instance of this, in the person of Serjt. H....y designer and engraver, at the Artillery Depôt, who has a decided cast of the right eye: the sight of which he has nearly lost. From the history of the case, it appears that it first came on when he was six years of age, from a fall on the back of his head, down a two pair of stairs; the fall giving rise to Hydrocephalus, followed by loss of sight, and squinting; the fall being the primary, the affection of the head the proximate or immediate cause of this double infirmity, and which is most probably dependant on disorganization (ramellisement) of the cerebral tissues. Finds that it does not interfere with his occupation: his sight through the left eye being exceedingly clear and distinct. If he shuts the left eye and attempts to walk, he feels a diziness come over him and he reels to and fro, like a drunken man—is able with the affected eye to distinguish colours, can make out the person of any one standing before him, and even the different parts of his dress; but cannot read print an inch in size—From the beautiful specimens that I have seen of his ability as a lithographer, he appears to be intimately acquainted with the art; and it is agreeably surprizing and interesting to see the high state of perfection to which he has attained, in the face of this infirmity. The eye itself, unless upon close inspection, does not present any striking appearance of disease, being apparently clear; the pupil likewise acts very readily. Finds that the squint is worse when his health is out of order it is liable to come on, or if present, to be temporally increased, by any thing that disagrees with his stomach; at other times, when in good health, it is scarcely *if at all* perceptible. I had occasion to attend him for Dyspeptic symptoms, and was much struck with the change apparent in the use which took place during the few days he was treated for the above—the cast which at first was most decided, having pro temp. disappeared—see observations of J. Walker Esq. on this subject note, p. 50.

The full success of the operation is, after all, dependant upon the patients themselves ; if they are quiet and offer no resistance, the operation, if properly performed, cannot fail of success - if however the operator proceeds in the face of opposition, there is great chance of its turning out incomplete. Much also of its success undoubtedly does depend upon be ing properly assisted—for if either the eyelids are allowed to close, or the small sharp hook be by the assistant who steadies it, allowed to loose its hold, not to mention what Mr. Brett, justly observes and insists upon, should the assistant fail in keeping the pupil steadied in the horizontal direction, as when handed to him: it may well be supposed a simple operation in itself, is immediately changed into a complicated one; the operator having, as it were, to seek for the muscle under the upper eyelid, into which as we perceive the involuntary muscles immediately draw it. The beauty and perfectness of this operation depends in a great measure upon a good light, and making a clear and sufficiently extensive opening in the conjunctiva, by *one* cut of the scissors, in the first instance: whereby much of the after ecchymosis, jagging of the conjunctiva, and subsequent grannulation, are avoided. Occasionally the muscle has been found very much developed (Lucas p. 57-8). In the case of the boy Burke above alluded to, the muscle was certainly larger than usual, and there was greater hæmorrhage than I had previously witnessed (the blood oosing over the cheek), on the other hand I never met with a case that shewed so little ecchymosis after operation, or that healed easier: with the exception perhaps of Mrs. Nurhnay's.

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* See note to page 27.

That likewise in many cases met with, much of the *ultimate and permanent* success of the operation, depends upon the patients themselves, by using the side practice of the eyes, even after the operation itself is well performed: is so evident in itself, and so well known to those who have paid any attention to the subject, that I shall only instance two out of the thirteen cases I have performed in this country: as coming more immediately under our present and direct observation. In my own Maty-Boy, on whom as it is perceived, I first operated here, and successfully, for the cure of a strabismus divergens of the left eye : the eye was subsequently drawn partially inwards, so much so, as to attract the notice both of Messrs. Thompson and Smyth, who saw him at the time ; by bandaging the right eye for a few days, and subsequently directing him to practice looking to the left, he, in the space of a month had not the shadow of a cast remaining – this, from having before I operated, squinted most abominably. Again, John Eason, double convergent strabismus, whose case is given above at length—had slight inversion of the left eye for some days afterwards, but by practising looking continually to the left, this in the space of three weeks altogether left him - the man being now in appearance altogether another individual to what he was when I first saw him a few months previous.

It will be perceived that M. M. Roux and Velpeau, as also many of our own surgeons, have considered this operation as unsatisfactory and not to be depended upon : and that, simply because they themselves neither knew, nor acted up to its true principles ; but fancied that the defect depended upon one or other of the muscles of the apparently affected eye, and that their division and the division of them alone, was the true, and only means of cure.

That the most eminent surgeons may occasionally be led into error with regard to the diagnosis of this apparently trifling and simple operation ! (that is to the operator if not to the patient) as some have heroically been pleased to term it ; is sufficiently shewn in the distressing case of Mr.G. P. 44.

Taking the results, from all that can be learnt upon the subject of this operation, it appears to have been successful in the majority of instances, averaging perhaps 29 in 30. Still many, though suitable cases, are recorded, in which either from malperformance in the first instance, or from the subsequent adhesion of the muscle to the selerotica anterior to the transverse axis of the eye ball, (see Lucas p. 81.) or to the same in connection with a too early cicatrization of the conjunctiva and subcellular tissue, (see Mrs. Nurhnays case p. 91,) the squint has come on again after the operation :*—or in fact (as mentioned by Mr. Ferrall in his enlightened views on the anatomy and pathology of the orbit), from the Tunica Vaginalis Oculi itself not being divided;† these cases are fortunately however very rare, and are scarcely to be viewed in relation to the general success of the operation itself.—When the defect arises from some external cause, as local injury, intestinal irritation, opthalmia, or as an effect of Fevers, it is far more favourable than when it can be traced to any disorder of the parts within the head itself.‡

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* When this does recur it can always be remedied by repeating the operation.

† This structure both from its original character, as well as the able manner in which it is treated by Mr. Ferrall, and the important part it appears to hold in the physical economy of the orbit : entitles it to the earnest consideration of the profession generally, and more especially to such as have directed their attention more immediately to the anatomy of the eye in connection with its Pathology ; and to which, as it is intimately connected with the especial object of these pages, I feel much pleasure in thus bringing to the notice of such of the Profession as may not have had the opportunity of becoming previously acquainted with the subject.

‡ When this defect arises from intestinal irritation, or fevers, it is frequently only temporary—as the cause is removed, so does the effect disappear. In these cases, if not of long duration, the operation would be both uncalled for, and injudicious—medical treatment being here more suitable.

In conclusion, time has shewn this operation to be permanently successful, when properly performed, and in suitable cases ; thereby, removing all fear of its recurrence.

This has been sufficiently tested by the experience of a couple of years. - I have myself never met with more than two instances of its recurrence in my own practice ; the one was easily and effectually removed by a re-division of the muscle ; the other, Mrs. Nurhnay's case, would have been as easily and speedily removed in like manner, but that the opportunity for so doing, did not offer ;* and indeed it speaks for itself, with the section of the tendon, the morbid nervous action is cut through, or if you choose, to speak more poetically, the spell is broken. However, this is pretty certain, that no increased action of any of the straight muscles, or simple puckering of the conjunctival or cellular membrane, has in any instance that I have seen, brought about such an effect ; in fact, it never does occur, unless as a casualty : and which fortunately is extremely rare ; when it does occur, the steps of the operation, as before stated, have only to be repeated.

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* Mr Walker (of Manchester) says in the Lancet, August. 7, 1841. "This operation which has only been introduced within the last few months, has now been performed on an immense number of individuals in all parts of the civilized world, and, so far as we can at present judge, with very considerable success. This operation is one of no great difficulty, and, only requires a little practice and a certain amount of tact to insure its rapid and efficient performance. It is not, however, to be resorted to without some degree of caution, since numerous accidents have occurred, either from rashness or awkwardness. Although the operation is generally very successful, yet I should say that it is much easier to divide the internal rectus muscle than to cure strabismus. In some cases the operation certainly fails ;* but it is no valid objection to its general performance, that it is not always successful. I do not know, indeed, whether sufficient time has as yet passed away since the introduction of the operation into practice, to enable us to decide as to the permanency of the improvement which is unquestionably effected in most cases.—It is now about twelve months since I first performed the operation, and all that I can say is, that up to this time all those cases in which the distortion of the eye was removed after its performance, the improvement, as far as I have been able to ascertain, still continues ; so that I think we may reasonably conclude that the improvement will be lasting. When an operation on one eye has been unsuccessful, we are recommended by Mr. Elliott of Carlisle, to proceed at once to the operation on the other ; whether the latter exhibit an appearance of squint or not. The reasons assigned by this gentleman appear to be very plausible, and his practice successful."†

* This is no more than what we should naturally expect to find was the case, as I have before shewn, from the very indiscriminate manner in which cases, the most unlikely to be benefitted by the operation—have been heedlessly submitted to—its would be miraculous effects—and of course success, has given place to, disappointment.

† These remarks coming from the pen of so eminent an Oculist as Mr. Walker, deserve the strictest attention; and it is with much pleasure I find that his views on the subject, coincide so very nearly with my own.

As regards the ultimate success of the operation for the *divergent squint*, by a section of the outer straight muscle, experience proves this to be equally successful ; provided the sound eye be bandaged immediately after the operation, and the patient directed to look constantly outwards with the lately affected eye for the first week or ten days ; by which, reunion *anterior* to the transverse diameter of the globe is ensured, and the adverse Trio* need not be feared. But, even should this have been neglected, and the worst be the case : any person who feels inclined to see my maty, (whose case is detailed p. 28) may satisfy himself (unless indeed he happen to have a cast in his own eye) that he (the maty) sees straight, with both eyes : and that the only effect of the operation remaining, is, as stated in his case, an inability to rotate the eye *completely* outwards ; it cannot in fact be moved outwards beyond $\frac{2}{3}$ of the visual circle—but most certainly the eye is not turned inwards, as some have erroneously stated, must decidedly be the case.

Lastly, respecting the permanency of the success of this operation—general experience has pronounced it, a benefit to society. To such as choose still to doubt both public opinion and the evidence of their own senses—I shall only say in the words of Bouhours. "Chacun en particulier peut tromper et être trompé : personne na trompè tout le monde, et tout le monde na trompè personne."

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* The three opposing straight muscles, supplied by the 3d pair of nerves.

Cuilibet in arte sua credendum est.

PART III.

The subject of vision being only part of a science which now enters into the general routine of academical education, even though the individual be not intended directly to pursue any of the more liberal sciences ; I shall not consider it too discursive or irrelevant to the subject of this work more immediately—to say a few words on the physiology of sight.

"The eye" says a celebrated writer* "is certainly the noblest of the organs of sense, it is that with which we should part the most unwillingly, and of which, when deprived, we are most helpless. A celebrated philospher says, how much more noble is that faculty by which we can find our way in the pathless ocean : yet, notwithstanding the perfection of the sense of seeing, much of this perfection is gained by the other senses, and particularly by that of touch. If the human body were motionless and inert, the sensation conveyed by the eye would be very imperfect : we should be able to conceive neither the distance nor the figure of objects. But, as it is, the visible magnitude of an object is the sign of its real magnitude ; which knowledge we have acquired by other means. When we look upon an object, we have its visible figure before us, as the sign of its real figure, which by experience, that is, by motion of the hand, by approach, and the actual comparison with our own bodies, we have in a manner more perfect previously ascertained. Without this combination of actual experience and true knowledge, of the associated signs in the eye, vision would be a continual delusion.''

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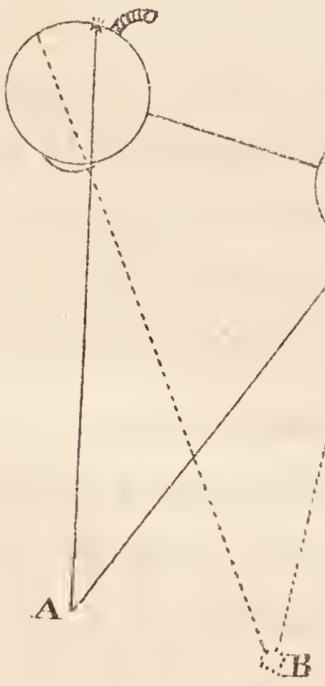
* Sir C. Bell.

To be able to derive any benefit from the detail of the above cases, and to arrive as before mentioned, at any just inductions from them, affording us rules for our future guidance : it is necessary to view this operation from a higher station than that of the mere division of muscular fibre ; to view it in its relative and intimate connection with the physiology of sight, and to which subject, in fact, it so naturally leads us, that without understanding the one, it is scarcely possible to become otherwise than mechanically acquainted with the other.

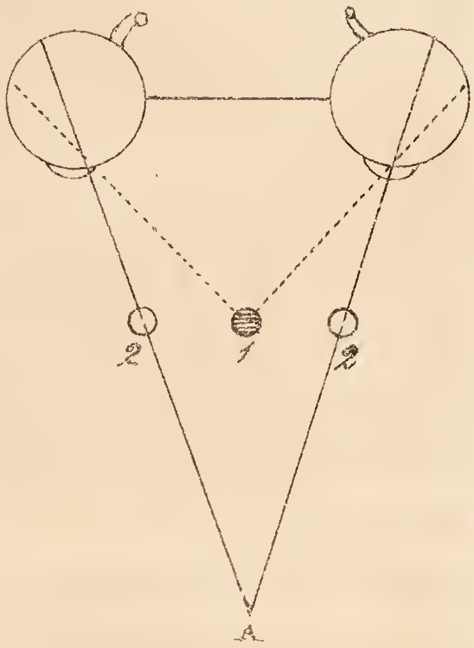
The natural uniform relation which the eyes in their healthy or normal state bear to each other, is certainly very remarkable. The more so, when we consider the apparent intricacy of the parts involved and the volition and consequent consent of opposing organs, which is absolutely necessary that the slightest alteration in their direction should be performed, and which we see take place with a rapidity and exactness truly admirable. Habit, education, or the will, has little to do with it, for we could not move our eyes contrary wise in any direction, if we were to try to do so,—no —in what direction one moves, in that, *the correspond-*

ing direction also moves the other; for instance, if one eye moves outwards, the other eye will move inwards; we can turn both eyes inwards to a certain degree,—so even as to see the point of the nose, and looking straight before us we can embrace the fingers or any object brought parallel to the external angles: but, we cannot turn both eyes outwards at the same moment; we must therefore view it as an involuntary action of correspondence, one of the natural involuntary laws of the animal economy—which commences with birth to end in the grave, unless interfered with by some morbid condition affecting either the brain, or the immediate nervous or muscular system of the eye itself; so much so is this the case, that even the stimulus of light is unnecessary to its due performance. How beautifully is not this balance of action shewn, when, after the operation for *staphyloma* we observe the glass eye moving with and accommodating itself to the motions of the sound eye? Again does not the poor blind man turn up *both* his eyes to Heaven, as he implores the mite of your compassion—and should his companion, the faithful dog, pull to one side, are not the eyes turned in correspondence to that side, to see as it were and guard against the coming danger?—The mind is active, and the will is active—but the motion of correspondence is involuntary.

In the majority of cases then, we shall find that strabismus is merely the absence of this agreement in the direction of the two eyes, and which constitutes the defect in question. We have seen in the preceding pages, that in a person who squints, one of the eyes is directed to the object and the other appears to be turned from it ; if the sound eye be shut, and the person be directed to look at an object with the other, it is directed to it with the proper and natural axis. Now this shows us that the sensibility of the proper spot in the bottom of the eye, is only weaker from want of use. But most people who squint have a defect of vision in the affected eye while the eye directed to the object has its natural sensibility to light. Now the mind does not attend easily to two impressions, the one being weaker than the other ; in a short time the weaker impression is entirely neglected, and the stronger only is perceived.



In illustration of the above, let us observe the eyes in their normal state ; let us say for instance the object A. corresponds exactly with the axis of vision ; of course it will be distinctly seen, and the impression of but a single object will be received ; and that because the rays strike upon corresponding points of the retina—on the other hand, the object B. though it will likewise appear single, still, it will be seen much less distinctly : each eye possessing as before observed but in one spot that delicacy of sensibility which constitutes perfect vision : but though less distinct, yet the image will appear single, the rays proceeding from it having precisely the same relation to the centre of the retina in both eyes. If again the eyes be fixed on any given object, and if another body be interposed, thus (1) within the angle, formed between the optic axes and the given object, it will appear double, the points of the retina, impinged upon by the rays proceeding from the nigher object, not bearing a relative correspondence to the central point of the retina. Hence, the eyes being directed to A. will see the object 1 double, somewhere near the outline 2.2., the line of the direction of the rays of light from the body 1 not impinging on the retina in the same relative optic axes as that proceding from A. Thus we readily explain the reason why objects which are much nearer the eyes, or much further distant than that to which the eyes are directed, appear double.



This sympathetic relation existing between the correspondent points of the two eyes is sufficiently well known and admitted to require being pursued further; for it is now received as an axiom, that images impinging upon corresponding points of the retina, convey the same impression to the mind, as if they had both fallen upon the same point of one retina; and images impinging upon non-corresponding points of the retina, but which proceed from one object, convey to the mind the same apparent distance and position of two objects, as if one of those pictures were carried to the point corresponding with it in the other retina.

In most cases likewise the vision of the squinting eye, as before noted, is less perfect, but whether this arises from, or be the cause of, or whether in fact both defective vision and strabismus are effects of one and the same cause: does not appear to be very clearly understood; "instead of an imperfect state of vision" says **Mr. Duffin** (p. 3.) "being a cause of strabismus, ninety-nine times out of the hundred we find that impaired sight is a result of this affection, and that as soon as the deformity is removed, the functions of the eye improve." Now, this though perhaps in itself too sweeping an assertion, is nevertheless strictly founded upon fact.—For supposing defective vision of one eye to have some casual connexion with the origin of strabismus itself, it can scarcely ever be the immediate or influencing cause: as much more frequently all degrees of defective vision of one eye exist without the occurrence of strabismus, as we daily meet with instances where a person sees, or fancies he sees, better with one eye than the other, and very generally a preference is given to the right.—When squinting comes on without its being apparently to be ascribed to a primary affection of the muscles of the eye itself, it is dependant on a want of equalization in the motor nervous influence directing their actions, a due regard to the correspondence of the optic axis not being observed; this occasions the images of objects to impinge upon a point of the retina of either eye of different degrees of sensibility, and thus in the first instance gives rise to double vision; but as this distortion is continued, single vision is gradually restored, though the points of the retina do not any more correspond. This we may infer from the section of the muscle restoring the eye in these cases to its normal position, by relieving it from the depraved nervous influence under which it acted ; for we find, that if the convergens be confined to one eye more especially, and under ordinary circumstances : (as in Anderson's case) the simple division of one muscle is sufficient to restore the parallelism of both eyes—but for which (though owing to the same disordered nervous influence only shewing itself in a more extended degree,) when both eyes are alternately and indifferently converged, (as in the cases of Miss——, Eason, Subawbedee, and Mrs. Nurhnay,) the division of the corresponding muscles in either eye then becomes necessary to restore the nervous balance. To this view also the causes to which in these cases (when not congenital) the patients themselves, whether correctly or not, impute the origin of the affection would naturally lead us—viz.—a continued mal-direction of the eyes indifferently, or a preference shewn for the one, owing to some circumstances connected either with place, position, or trade, and which is sufficiently shewn in the cases of Mrs. Nurhnay,* Miss—— little sister,† and Eason.‡

The natural conditions then of the eye, in common with the rest of the body, are, as we know, two fold : a state of rest, all sensation being for the time dormant; and a state of activity or watchfulness, the nerves both of sight and voluntary motion being cognizant.

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* Ascribed to the room in which she was brought up having a great many windows—and to this cause also she ascribes the temporary squint of her two elder sisters.

† The parents considered it to have arisen from a way the child had when in arms of looking round over her shoulder to her elder sister, who was thus frequently in play attracting her attention.

‡ To his trade (Turner in wood and metals) requiring a steady and fixed gaze of one eye : and a preference to be continually shewn for the left.

When the eye is at rest, as in sleep, all visual sensation being for the time neglected : the straight or voluntary muscles resign their office, and the oblique or involuntary muscles draw the pupil under the upper eyelid. This we see if we approach a person in disturbed sleep, when the eyelids are a little apart, for then the white of the eye only is visible : and this we more particularly have an opportunity of observing in infants, in whom this affection is also especially seen when labouring under that temporary derangement of the sensito-motor nervous influence, known under the term of " inward fits," and dependant on intestinal irritation which is generally supposed to arise from wind ; the effect of which, is to produce for its expulsion, unequal pressure of the muscular fibre upon the sensient extremities of the nerves, the immediate cause of griping pain ; which, through the sympathetic chain of action is conveyed through the sensito-motor column to the pathetici or Trochliares, the fourth pair of nerves : thus giving rise to the above named appearance; and this naturally leads us to refer to their origin. We find that they arise from the upper part of the spinal marrow near the origin of the portio-dura of the seventh pair, at a part remote from all the other nerves that run into the orbit. It threads its way amongst the other nerves without touching them, and is as we see, entirely given to one muscle, the superior oblique. The question then becomes, to ascertain if we can from this, what are its peculiar functions: for we see it differs in its origin from all the other nerves of the orbit —from the nerve of vision, the nerve of common sensibility, and the nerve of voluntary motion ; and in this at least we find sufficient to account for its action being so evidently different from that of the other motor muscles of the eye.

So also during attention to the impression on the retina, the straight muscles are in a state of activity : but when that attention is withdrawn, these muscles are relieved and the eyeball comes under the influence of the oblique ; this we observe not only takes place in sleep, but also in fainting,* in intoxication, likewise on the approach of death. This last we have doubtless all had the melancholy opportunity of observing when tenderly watching the departing spirit of some dear relative, and which gives a false appearance of agony to the features.—This action however appears to be sufficiently explained by the fact of the recti being voluntary muscles, hence, these suffering debility in the first instance, leave the natural *involuntary* action of the oblique, unopposed.

Upon this subject Sir C. Bell says "there is a motion of the eyeball which, from its rapidity, has escaped observation. At the instant in which the eyelids are closed, the eyeball makes a movement which raises the cornea under the upper eyelid" again "if we fix one eye upon an object, and close the other eye with the finger in such a manner as to feel the convexity of the cornea through the eyelid, when we shut the eye that is open, we shall feel that the cornea of the other eye is instantly elevated, and that it thus rises and falls in sympathy with the eye that is closed and opened. This change of the position of the eyeball takes place during the most rapid winking motions of the eyelids."

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* As the insensibility comes on, so does the look become vacant, and shortly the white only of the eye is disclosed by the revolving of the eyeball upwards.

In relation to the motions attributed both to the superior and inferior oblique muscles, it is nota little curious as well as surprizing, to observe the opposite views taken upon this subject by some of the most eminent writers of the present day : and the ingenuity and perseverance shewn by each in elucidating and explaining his own individual views to be correct, both by analogy, as well as by indefatigable experiment. Truth to say, however, all cannot be right : and considering the careful and scientific manner in which these different, numerous, searching, and apparently satisfactory experiments have been conducted : it becomes a matter of consideration to which of the following names we must bow ; Bell, Bidder, Von Ammon, L. Boyer, Marshall Hall, Volkmann, Valentin, Duffin, Ferrall, no two of whom appear to have exactly hit their heads together, though many take a sly slap at Sir C. Bell. Be this as it may, the number of calves, sheep, goats, rabbits, dogs, and cats, that have fallen martyrs to the cause of science: might pretty well have supplied a whole army ; to say nothing of the horses, donkeys, and monkeys. These last gentry after all, are I believe the only ones offering fair chance for experiment, from their analogy to the human eye : and to them for this reason, Sir C. Bell in his experiments gave a flattering preference : and which also I believe must cause a preference to be given to the experiments of Sir C. Bell ; even though some of his experiments on the oblique were likewise performed on rabbits.

As I have had occasion in these pages to dwell much upon the parallelism* of the eyes, it will be perhaps as well to notice more particularly what this parallelism consists in : and to understand which fully it was necessary that we should in the first instance have some little previous knowlege of the anatomy of the eye, as well as, a general idea of the principles of optics,† by which we prove geometrically, how the rays of light are refracted through all the humours of the eye so as to form a distinct picture on the retina.‡ Let us in the first place then understand this subject : and then observe the relation it bears to the parallelism of the eyes; rendered as it is more interesting at the present moment, in connection with the subject of squinting.

The Physiology of vision to be properly understood must be studied in its two-fold relation in connection with mathematics as well as with anatomy—for to view it from either of these sciences singly, could tend but to a mischievous fallacy, the fallacy of induction from false data—for as we perceive mere mathematicans have been impressed with the notion that the centre of the spherical surface of the retina, and the centre of the lesser spherical surface of the cornea, are the same. On the other hand anatomists have ascribed too much to the lens, and too little to the cornea,—considering the former to be the chief medium of refraction in the eye, whereas they should more correctly have ascribed the greater refracting power to the latter.—Hence they state that when the lens is lost, as after operation for cataract, the powers of the eye are greatly weakened ; that is to a greater

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* See a case of loss of parallelism of the eyes and strange illusions of sight—Dr Crichton, vol. 1. p. 147.

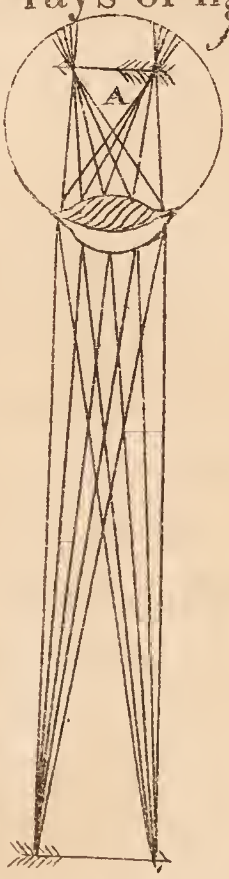
† See Smiths optics vol. 1. in which is also mentioned a case of squinting and double vision occasioned by a blow.

‡ This was first shewn by Keppler in 1600.

extent than we find really is the case. (See observations of Mr. Brett on this subject p. 126.)

The eye is so formed as to receive and collect the rays of light in such a manner as to reflect upon the retina the image or picture of the object which the eye looks at, and the point where these different rays meet is called the focus. The object is painted upon the retina in an inverted manner, the rays from above falling upon its under part, the real situation of the object being judged of either by habit or by an instinctive faculty of the mind ; that the rays of light may terminate distinctly on the retina, it is necessary that both the cornea (the lucid anterior part of the eye) and crystaline lens* should have a certain degree of convexity. If either the one or the other be too prominent, or if the ball of the eye, that is the diameter of the vitrious humour in the axis of the eye be too great, then the person does not see distinctly ; because the power of the humors, in contracting the rays of light is too great, and the focus or image of the object will be formed not accurately on the retina, but (as shewn in Fig 1) at A before it reaches it, as is the case in short-sighted people : who, require concave glasses to enable them to see objects distinctly, at the proper and ordinary distance. If on the contrary, the cornea or lens be too flat, or the refractive power of the humors be in any way diminished, the focus will then be imperfectly formed, till the object is viewed at a greater distance than or-

Fig. 1.



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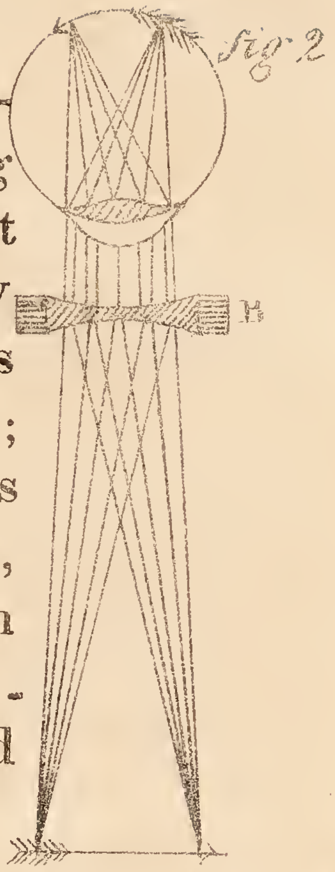
* Described p. 20.

dinary, as is the case with persons advanced in life, to whom the assistance of convex glasses become necessary.

But as this indistinctness of vision, which we meet with in young people proceeds from no opacity, but only the disproportion of the convexity of the eye to the diameter, the defect is corrected by the concave glass B ; (Fig. 2.) for, the effect of this glass being the reverse of the convex lens, it causes the rays to fall correctly upon the surface of the retina ; that is, it corrects the too great convergens caused by the convexity of the humours.



Near-sighted people see distant objects indistinctly : nor have they generally either a steady or piercing gaze, as the eye does not so readily rest upon the surrounding objects. We are all aware of, and have all seen short-sighted persons half closing their eyes, and peering as it were through the eyelids : and this they do from a natural instinct, for this in reality does correct the sight in some slight measure, by changing the direction of the rays of light,* and thus correcting the inaccuracy of the image on the retina : the margin of the eyelids or the eyelashes to a certain degree imitating the concave lens by attracting and dispersing the rays. (See Fig. 2.) This we experimentally see, by holding a card having a hole in its centre so as to approach a stream of light passing through the window : when it will so attract the rays, as to extend the margin of the figure of the circular spot of light upon the wall ; this we also commonly see in light, or the direct solar rays passing through the key-hole of a door.

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* This effect will be observable more or less according to the comparative near-sightedness of the individual—one who is very near-sighted, who requires for instance No. 8—will by nearly closing the eyes see *considerably better*—whilst a person simply using a glass of less power say No. 4 would by so doing see worse, but by only slightly contracting the lids, he would to some slight, though scarcely appreciable degree promote the clearness of sight.

When on the contrary, however, the cornea or lens is too flat, or the refractive power of the humours is in any way diminished, the focus will then be imperfectly formed, till the object is viewed at a greater distance than ordinary : and this effect we meet with in elderly persons, occasioning them to have recourse to artificial convex lenses, or glasses. The insidious effects of advancing age are gradually to reduce the prominence of the eye by a decrease of the humours and a lessened convexity of the cornea : and so in fact to bring it to the reverse condition of the near-sighted eye ; the focus or image of objects not being formed soon enough to impinge accurately upon the retina, but over-shooting as it were and passing beyond the mark, B (Fig. 3), the indistinct impression of the image only, being conveyed to or reflected upon the retina; hence near-sightedness naturally diminishes with age.* In the marginal figure is represented the effect produced by age on the humours of the eye ; we see that without the intervention of the glass A. the rays would pass to form the image beyond the retina as at B ; but by using the convex glass A. (same as those used in the spectacles of elderly people) the direction of the rays of light is so corrected, that the image falls accurately on the bottom of the eye.

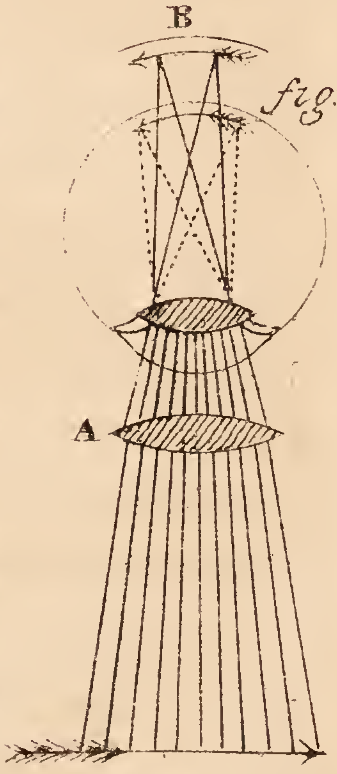

fig: 3

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[*] Particular cases, may produce particular exceptions : where for instance from any exciting cause, the naturally weakened state of the eye passes into amauroses, or cataract.

We have observed that near-sightedness occurs in young people : and, that the reverse takes place in the elderly, that is to say, more commonly after the age of forty. The cause of this difference we have seen : as well also, how old age naturally corrects near-sightedness by gradually reducing the convexity of the eye, and thus enabling persons to see objects further removed : until by degrees, the sight becomes of the usual standard.

The image or figure is as we have before observed, painted at the bottom of the retina, and in an inverted osition ; this has given rise to some very fanciful theories to account for its appearing to us erect : as it in reality is ; but in truth the terms above and below have no relation to the image in the bottom of the eye, but rather to the position of our bodies, and the surrounding objects.

* " When an object" says Sir C. Bell " approaches towards the eye, the diameter of the picture on the retina increases in the same proportion as the distance between the eye and the object decreases ; and consequently it decreases in the same proportion as the distance increases. But the degree of brightness of the picture of an object on the retina continues the same at all distances, between the eye and the object unless some of the rays of light are interrupted in their progress ; for as the advancing object becomes bright, it increases doubly in length and breadth, or quadruply in surface. The faint appearance of remote objects is occasioned by the imperfect transparency of the atmosphere" Few things in relation to the eye appear to have puz-

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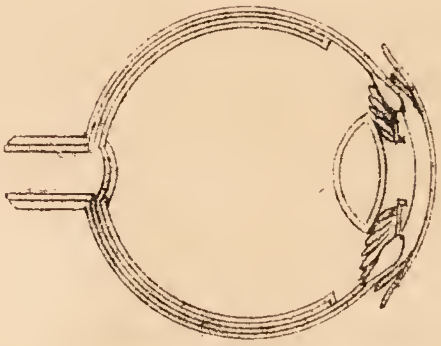
* Sir C. Bell, Philosophy of vision.

zled physiologists more, than to account satisfactorily for the manner in which the eye adapts itself to the distance of objects, but which modern research appears to have decided with an apparent shew of correctness, whether it be so in reality or not, by ascribing it conjointly to the mechanism by which the lens is shifted forwards or backwards, dependant upon the contraction and dilatation of the pupil drawing on the lens by its attachment, through the ciliary ligament : thus we perceive upon the admission of a strong light the pupil contracts, drags forward the lens, and so, by elongating the distance causes the image to form anterior to the true optic axis, (see figure) and so deadens the shock to the extremely sensient retina, which the glare of light would otherwise have communicated ; and which action is of course reversed with the altered position of the lens. However, as this, like the plausible theories respecting the spleen, or the Pineal and Thymus glands, may be considered a point not altogether *proved*, though each have according to the fashion of the times been alternately advanced and set aside : perhaps, the future generation grown wiser than their fathers, may even venture to doubt the infallibility of our present views. Bearing in mind then that it may still be considered fair field for further inquiry, though the generally received opinion of the day : I will, as such, take the liberty of transcribing with the accompanying figure the very



judicious observations of Mr. Brett in relation to it, in his work on surgery in India; (p.p. 438, 9,) coinciding as they do so intimately with the views entertained upon the same subject by Dr. Brewster: and in many respects with those of Sir C. Bell, whose enlightened and phylosophical views on the subject we shall presently notice.

"The most distinguished philosophers have entertained different opinions respecting the method by which the eye adjusts itself to varying distances. Some have ascribed it simply to dilatation and contraction of the pupil; some to the elongation of the eye, by which the retina is removed from the crystalline lens, some to the motion of the crystalline; and others to a change in the convexity of the lens, on the notion that it consists of muscular fibres. The second and last suppositions scarcely merit a refutation. The elongation of the eye by muscular compression would occasion an alteration in the curvature of the retina, and consequently the centre of the visible direction, and produce a change of place in the image. To my mind it appears evident that the power of adjustment depends in a great measure on the mechanism which contracts and dilates the pupil, as is exhibited in Fig II Plate XI. The pupil contracting when the individual is looking on near objects, causes the ciliary bodies attached to the base of the iris, to draw the lens forwards, and, vice versa, the dilatation of that aperture causes the crystalline to recede and approach therefore nearer to the retina.* Dr. Brewster (treatise on optics, and Edinburgh Journal of Science) is of opinion that this adjustment is effected by two actions; one of which is *voluntary* depending wholly on the will, and the other *involuntary*, depending on the stimulus of light falling on the retina. But although we must admit the truth of the general doctrine of the power of adjustment depending chiefly on the shifting of the lens, and although I acknowledge its doubly refracting structure and that its peculiar texture and gradually increasing density as it approaches its centre enables it to correct the spherical observation of light, yet I must think that the loss of this body is not attended with so great a degree of deficiency with respect to those powers of the organ generally, PROVIDED the remaining parts of the eye, and especially the transparent media, are in the highest possible state of health. Numerous instances have occurred to myself, where vision has been scarcely inferior, even without glasses, to that which is enjoyed by the best eyes which have never undergone any operation, especially in young subjects, and where there has been the least possible injury consistent with the removal of the diseased lens.[*]

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* The varying observations on this subject, by Descartes, Drs. Jurin, Munro, Young, Saunders, Farre, Leeuwenhoeck, Mr. Ramsdon, Dr. Brewster, and others, have only been repeated by later writers, under a different garb: and still, perchance, as inconclusively; though

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in justice to the present views of Mr. Brett, they have the merit both of simplicity and ingenuity (two of natures chief characteristics in the animal economy) and remove the necessity for a supposed power inherent in the lens itself, to alter its degree of convexity, and thus accommodate itself to the distance of objects; and renders any pressure or agency of the orbitar muscles unnecessary[†]—though on the other hand, it neither disproves, or accounts for, the elasticity of the cornea, and its power (explained in different ways) of varying according to the distance of objects, and which has been most ingeniously shewn by Drs. Jurin, Young, and Mr. Ramsdon[‡]

[†] Sir C. Bell on the subject, of Vision—says "The eye is enabled to judge and accommodate itself to objects at different distances by the action of its muscles increasing or diminishing the length of its axis, and by the motions of the iris allowing a greater or smaller quantity of light to be thrown into the eye.

[‡] Philos. Trans. 1810.

[*] Dr. Young[†] is positive that, in those who have lost the crystalline

I mean particularly in cases of successfully performed division or extraction, where none of the posterior structures have been touched, and a scarcely perceptible curvilineal cicatrix of the cornea remaining. It is chiefly in displacement of the lens, where the hyaloid membrane is more or less broken up, the ciliary processes wounded, or the retina pressed upon by the depressed lens acting as a foreign body, that such very imperfect vision or even total loss of it results. In successful cases we must attribute their distinctness of vision in a great measure to the contraction and dilatation of the pupil, and the power of *attention*, and their sight is capable by exercise of very considerable improvement.*

It is to provide against the more or less diminished refracting power of the eye that we avail ourselves of the imperfect substitute afforded by artificial convex lenses, or cataract glasses, with which likewise we have the power of occasionally changing the focal distance by shifting the glass forwards or backwards. They ought not, however, to be too hastily employed. So long as the patients vision is improving by the unaided powers of the eye, so long should he refrain from their employment. The glasses should be double convex, of the finest crystal, and of about

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humour by operation. the focal distance is totally unchangeable. Sir E. Home on the other hand, believed he had by experiment, satisfactorily determined that a patient. after the extraction of the cataract still retained the power of adapting the eye to the distances of objects.

† Philosl. Trans. for 1793.

* My own experience leads me to coincide with these observations of Mr. Brett ; nor have I ever seen occasion to doubt an inherent power in the eye to accommodate itself more or less to the distance of objects after the lens is extracted ; and though this of course disproves in a great measure the all-sufficiency of the lens, still it does not detract from its being the chief agent (and in the manner above shewn (subservient in the natural adaptation of the eye to the relative focal distance of objects.

2½ inch focus for reading, or examining minute objects, of 4½ inches for viewing distant objects. The best test of a cataract glass is, that it enables the person to distinguish objects placed before him at that distance at which he could see them before he became affected with Cataract. It is sometimes necessary to select two glasses of different powers, where two eyes are found after operation to have different points of vision."

On this subject Sir C. Bell remarks in his work on Anatomy P.121. "Amongst the variety of opinions, the innumerable, ingenious, but contradictory experiments for discovering the manner in which the eye adapts itself to the distance of objects, I am, for my own part, much at a loss to determine which I should prefer. I have often doubted whether these experimenters were not in search of the explanation of an effect which has no existence. I have never been able to determine, why a very slight degree of convexity in the cornea of a short-sighted eye should be so permanent during a whole lifetime, were the cornea elastic in the manner supposed, and capable of being altered in its convexity by the action of muscles. A near-sighted person, with the assistance of a concave glass, can command the objects to the distance of some miles, and, with the glass still held to his eye, can see minute objects within three inches of the eye. Now, I cannot conceive how the concave glass should give so great a range to the sight, as there can be no change in the glass, it must be the eye which adapts itself to the variety of distances, yet without the glass it cannot command the perfect vision of objects for a few feet. Again, a short-sighted person sees an object distinctly at three inches distant from the eye ;—at twelve feet, less distinctly ; and, when he looks upon the object at twelve feet, the objects beyond it are confused, just as they appear to other men ; but when he directs his attention to the more remote objects, those nearer become indistinct. Now, this indistinctness of the object, seen when he examined narrowly the objects beyond them, would argue (did we admit this muscular power in the eye of adapting itself to objects) that the cornea or the lens has become less convex, were we not previously convinced that the utmost powers of the eye could not bring the object at the distance of twelve feet, or any other intermediate distance, to be more distinctly seen than the fixed and permanent constitution of the eye admits.

I cannot help concluding, therefore, that the mechanism of the eye has not so great a power of adapting the eye to various distances as is generally imagined, and that much of the effect attributed to mechanical power is the consequence of the motion of the pupil, the effect of light and of attention. An object looked upon, if not attended to, conveys no sensation to the mind. If one eye is weaker than the other the object of the stronger eye alone is attended to, and the other is entirely neglected ; if we look through a glass with one eye, the vision with the other is not attended to. Now, objects, as they recede from us, become fainter and fainter in their colours, and the general effect upon the eye is different from those which are near, and as it happens that the mind must associate with the sensation before it be perfect, there is, consequently,an obscurity thrown over distant objects when we contemplate near ones: as, on the other hand, the images of near ones are not attended to when the mind is occupied with distant ones, although they be nearly in the line with the distant object examined. The mind, not the eye, harmonises with the state of sensation, brightening the objects to which we attend. In looking on a picture, or a panorama, we look to the figures, and neglect the background, or we look to the general landscape, and do not perceive the near objects. In short, we experience the whole phenomena presented to the eye when the shades and colours of nature are presented to us from a plane surface, as when the eye opens on all the varieties of a natural scene. It cannot be an adaptation of the eye, but an accommodation and association of the mind with the state of impression."

This is the elegant language of a mind of the first order, and captivates the understanding; for though we may not be able immediately or at least more definately to account either upon mathematical, or anatomical principles for this intimate and general association between the mental and visual faculties, and their relative influences upon each other: still, we cannot avoid being more or less aware of the truth of these observations. I shall now conclude, having in the preceding pages taken a brief but general view of the physiology of the eye in its different relations to the animal economy: though more particularly as it respects the operation, which forms the present subject; and which I trust will be found in this Country, what time has proved it to be in Europe – a relief and blessing to that portion of society, who have heretofore laboured under this unpleasant and disfiguring infirmity. – For certain it is, that the beneficial effects of this operation only require to be generally known, to be both more extensively had recourse to, and more fully appreciated.

Ex abusa non arguitur ad usum.

EXTRACTS FROM MR. FERRALL'S OBSERVATIONS ON THE ANATOMY AND PATHOLOGY OF CERTAIN NEW STRUCTURES IN THE ORBIT.

Anatomy of the tuniea vaginalis oculi, and muscles of the eye.

Zinn, Soemmering, and all former anatomists, describe the ball of the eye as being cushioned on fat, and in immediate contact with its muscles. Mr. Lawrence, no inconsiderable authority on this subject, and whose opinion may be supposed to represent that of all living anatomists, speaking of the anatomy of the conjunctiva, says, " thus, this membrane is reflected from the palpebræ to the whole circumference of the globe, forming a circular fold, which, at the point of reflection, corresponds to the fat of the orbit."

Having, however, separated the divided conjunctiva, we expose, not as has been described by anatomists, a cushion of adipose tissue, but a distinct tunic of a yellowish white colour, and fibrous consistence, continuous in front with the posterior margin of the tarsal cartilage, and extending backwards to the bottom or apex of the orbit, where its consistence becomes less strongly marked. By proceeding in the manner I have mentioned, the parts are displayed without any elaborate dissection. The sharp end of a probe, or director, will be sufficient to separate the ball of the eye from the new organ, by breaking gently the fine cellular tissue which connects them. Its colour is totally different from that belonging to its external surface, and it is here perfectly smooth, where the eye glides over it in its movements. The muscular substance of the recti muscles is no where visible, they lie on the outside of this tunic, which insulates and protects the eye in the most perfect manner.

The most beautiful portion of this mechanism, however, remains to be described. In the concavity of this tunic, and about half an inch posterior to its anterior or orbitar margin, are to be found six well-defined openings, through which the tendons of the muscles emerge in passing to their insertion in the sclerotic coat, and over which they play, as over pulleys, in their course. The tendons are loosely connected to the edges of those apertures by fine cellular tissue, which opposes no obstacle to their gliding movements.

The physiology of this tunic, which I have ven. tured to term the TUNICA VAGINALIS OCULI, will be conveniently considered in relation to each of its separate offices, namely, as an investment and protector of the globe of the eye, and as regulating the direction in which the muscles of the eye are to exert their force. In either of those capacities, this new and beautiful apparatus (independent of its pathological importance) appears to possess a physiological interest, entitling it to a high place among the many evidences of design, with which the animal frame abounds.

The uses of this tunic, as a covering, will be obvious from a brief consideration of the inconveniences to which, without this protection, the eye would be subjected during the action of its muscles. These muscles, it has been invariably taught, were in close contact with the globe of the eye, on their passage to their insertion, the interspaces being occupied by the fat of the orbit. This description of the parts, which is to be found in the works of the best authors, implies, that during the frequent action of its muscles, the eye must sustain a pressure as great and as suddenly applied, as the movements of the organ are rapid and energetic. Yet this could hardly have occurred without producing some phenomena capable of exciting our attention.

Now, according to the received anatomy of the orbit, the globe of the eye is grasped by the recti muscles in such a manner, that they must, during their action, exert upon it a sudden pressure analogous to that described by Sir Charles Bell. And when we consider, that between their origin and insertion they include the most prominent portion of the eyeball, it is obvious that the sudden swelling of their bellies during their action, (proverbially known to be as quick as thought), must have produced a flash of light, if no protective partition had existed between them. The use, then, of this tunic as a covering appears to be, to separate the eyeball from its muscles, and to protect it from pressure during their action.

As regards the second office of the tunica vaginalis oculi, and which more especially belongs to the mechanism of its openings, the following considerations naturally present themselves to the mind.

Two different functions have been assigned to the recti muscles. The one is rotation, or rolling the eye on its axis in different directions ; and the other, less generally admitted, is a certain degree of retraction of the globe within the orbit. The former was recognized, rather because rotation was a fact of obvious occurrence, than because the received anatomy of the parts afforded any clue to its explanation ; and the latter, or retraction, was admitted, not because it was ever actually seen to take place in the human eye, but because the supposed structure of the parts seemed to render such an action inevitable.

Certainly, if the tunica vaginalis had no existence, it would be difficult to imagine how the recti muscles could communicate the rotatory movements to the eye, without, in a greater degree, exerting a retracting power; and if more than one muscle were in action at the same time, it is manifest that the latter force must predominate. It is certain that the human eye has never been observed to have been retracted within the orbit; but why the muscles were prevented from communicating this movement, has never been hitherto explained.

Retraction is known to take place in some of the lower classes of animals; but in them an additional muscular apparatus is provided for the purpose. The strong retractor muscle, or bundle of muscles, is inserted into the globe of the eye at its posterior part, near the entrance of the optic nerve, and cannot, therefore, exercise any injurious pressure on the organ. In certain of those animals, in which I have found the tunica vaginalis developed, the recti muscles appear to me to antagonize the proper retractor, by the passage of their tendons over the trochleæ described. This may be made obvious by pulling the retractor, and consequently the globe of the eye backwards into the orbit, when the tendons of the recti muscles will be drawn backwards along with the eyeball, and made to play freely over the pulleys in the tunic. I am inclined to believe, therefore, that in those animals the eye is brought back into its proper position, by the recti muscles, when the retractor ceases to act.

There can be no doubt, then, that the force exerted by the recti muscles of the human eye, acquires a new direction by the passage of their tendons over the trochlæ in the tunica vaginalis. They are enabled by this contrivance to act as if they arose from the sides instead of the bottom or apex of the orbit, while they possess a range or extent of motion greater than in that case could belong to them. They enjoy the extent of motion which is the property of length of fibre in muscle ; while a suitable direction is given to their action by the mode in which their tendons are conducted to the eye. Many additional observations might be made in reference to the offices of these structures. Enough, however, has been advanced to show, that the received anatomy, and known functions of the parts, involved a series of physiological contradictions, which a knowledge of this new and beautiful mechanism at once reconciles and explains.

Extirpation of the globe.

The reflections suggested by a review of the cases which led to the present inquiry, as well as of this new and curious mechanism itself, may be reduced to the following propositions :

1st. That the description of anatomists, which places the globe of the eye in contact with the fat and muscles of the orbit, is erroneous.

2nd. That there exists a fibrous tunic, investing and insulating the eyeball, and separating it from all the other structures in the orbit.

3rd. That the uses of this tunica vaginalis oculi are, to present a smooth surface, facilitating the movements of the eye ; and by its density and tension, to protect it from the pressure incidental to the swelling of its muscles during their action.

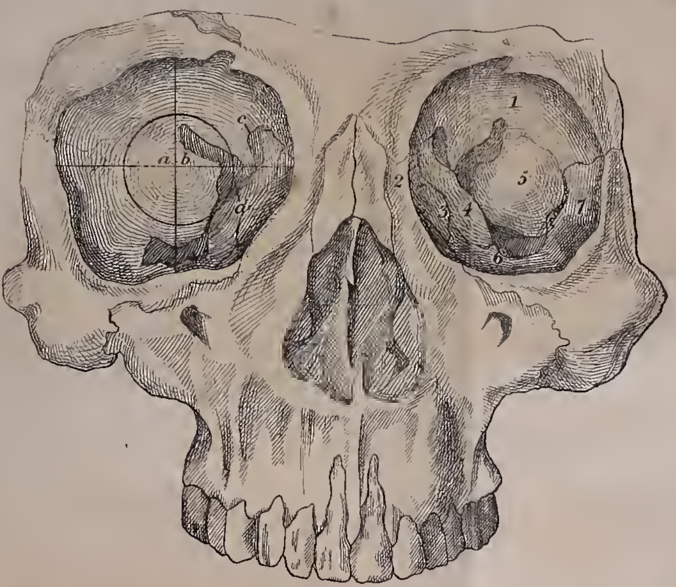
4th. That the openings in this tunic perform the office of pulleys, giving a proper direction to the force exerted by the muscles,—securing the motions of rotation, and opposing those of retraction, which would otherwise predominate.

5th. That certain cases of disease within the orbit, accompanied by protrusion of the eyeball, are to be explained, only by reference to the tunica vaginalis oculi, and the other fibrous tissues now described.

6th. That a correct knowledge of the anatomy of the orbit and of the fibrous structures alluded to, is essential to the operating surgeon, in dealing with abscesses and tumours, in extirpation of the eyeball, in the operation for strabismus, and all operations on that cavity.

PLATE 1.

Fig. 1. *Plan of the Orbit. Shewing its formation*



a. The centre of the socket where its two diameters cross.
b. Centre of the pupil, nearer the inner angle of the eye.
c. Foramen Opticum (The opening through which the optic nerve passes into the orbit)
d. Inner end of the Foramen Lacerum or Jagged opening (a passage for the general bloodvessels and nerves of the eye and its appendages.)

Each Orbit consists of seven Bones viz.........

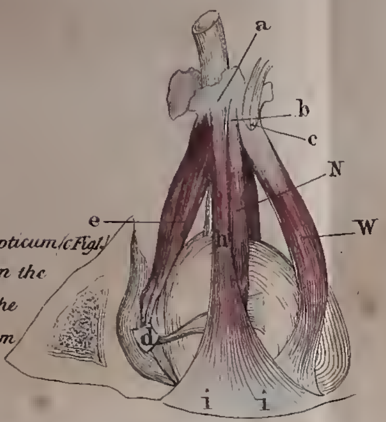
1. Os Frontis.
2. Os Sphenoides.
3. Os Ethmoides.
4. Os Maxillare Sup^r.
5. Os Palati.
6. Os Lacrymale.
7. Os Malæ.

1. Superiorly is placed the Orbitar plate of Os Frontis (bone of the fore-head)
2. Nasal process of the Os Maxillare Superius (upper jaw bone) Anteriorly, and internally.
3. Os Lacrymale placed behind it (a small bone upon which rests the gland from which the tears are secreted)
4. The flat plate of the Os Ethmoides placed posterior to the last.
5. The orbitar plane of the Os sphenoides forming the back and outerpart of the orbit. { *bones more intimately connected with the inner parts of the skull.*
6. Os Palatii (Palate bone) serving to form the floor of the Orbit.
7. Os Malæ (Cheek bone) forming part of the floor and outside of the Orbit.

Note. The Foramen Opticum (c Fig. 1) and upper part of the Foramen Lacerum (d) are much above the centre of the orbit, and towards the inner side, whence it is plain, that the Optic nerve in going towards the ball of the eye, moves a little outwards and downwards.

Likewise, (Fig. 2.) those muscles that have to go round the globe of the eye or pass under it to get at their insertions, must be longer than those which keep to the inner side, or go over the globe.

Fig. 2. *Left Eye viewed from above shewing its muscles and their attachments.*

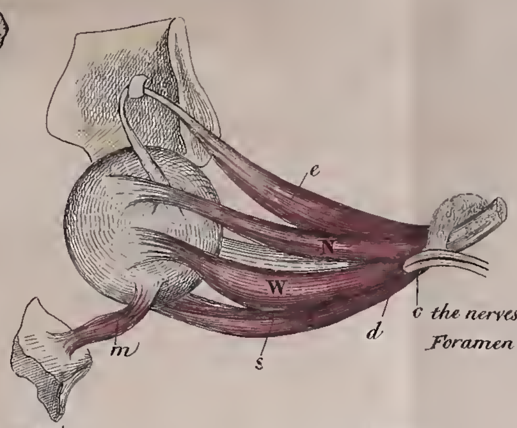


The muscles arise from the bottom of the socket round the root of the Optic nerve (nerve of sight)

Two of the five muscles viz. { *Levator oculi* / *Trochlearis* } *arise from the outer coat of the Optic nerve where it comes through the Foramen Opticum (c Fig. 1.) The other three arise by one common tendon from the Dura Mater (seathe of the nerve) where it covers the Foramen Lacerum (d. Fig. 1.) forming the Periosteum of the Orbit.*

Fringed edge of the dura mater surrounding the root of the optic nerve.
The origins of the Levator (upper straight muscle) and Trochlearis (pulley) in the angle where the dura mater turns backwards.
Origins of the Abductor and Deprimens from the periosteum of the Foramen Lacerum.
Cartilaginous Pulley of the Trochlearis muscle attached to the superciliary ridge of the Frontal Bone.
Superior oblique or Trochlearis. the longest muscle of the eye.
The upper straight muscle.
The outer straight muscle or Abducens, is the longest of the straight muscles.
Levator Palpebræ Superioris (or muscle raising the upper eye-lid) lies over the other muscles, and expands into a thin membranous flesh i i *which runs imperceptibly into the substance of the upper eye-lid, and is inserted into the whole length of its cartilage.*

Fig. 3. *Left Eye shewing a left end view of the same.*



c the nerves that enter the socket by the Foramen Lacerum. (Jagged opening.)

e The Pulley or Sup^r oblique muscle (Trochlearis)
N Upper straight muscle (Levator)
W Outer straight muscle (Abducens)
S. Lower straight muscle (Deprimens)
m Inferior oblique.
c. Origins of the external and lower straight muscles.
d. Tendons of the outer straight muscle which is a Biceps (has two origins)

PLATE II.

Fig. 1.

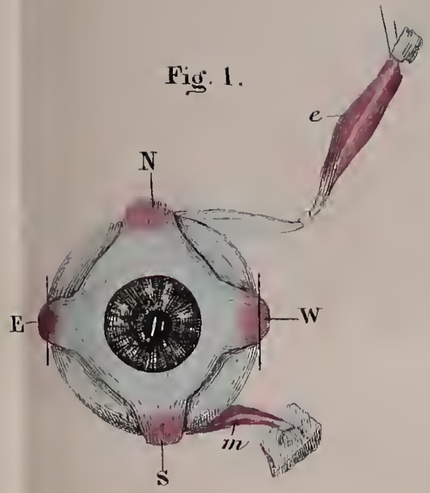


Fig. 1 Right Eye. Front view shewing more immediately the muscles divided and the point of division.

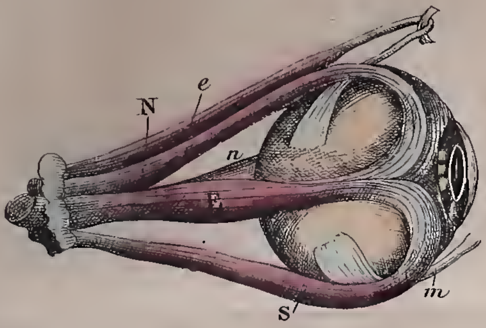
*e The Pulley or superior oblique muscle - Trochlearis**
N *Upper straight muscle or Levator*
E *Outer straight muscle or Abducens †*
S *Lower straight muscle or Deprimens.*
W *Inner straight muscle or Adducens, the shortest of the straight muscles.***
m The Inferior oblique the shortest muscle of the eye.

* *So named from passing through a cartilaginous pulley confining it to and making it draw, in the direction of the upper and inner part of the orbit.*

† *The one divided in external squint; shewing also the extent to which the delicate lining membrane of the eye (conjunctiva) is divided, as well as, the point at which the muscle itself is bisected.*

** *The one divided in internal or converging squint, shewing the same.*

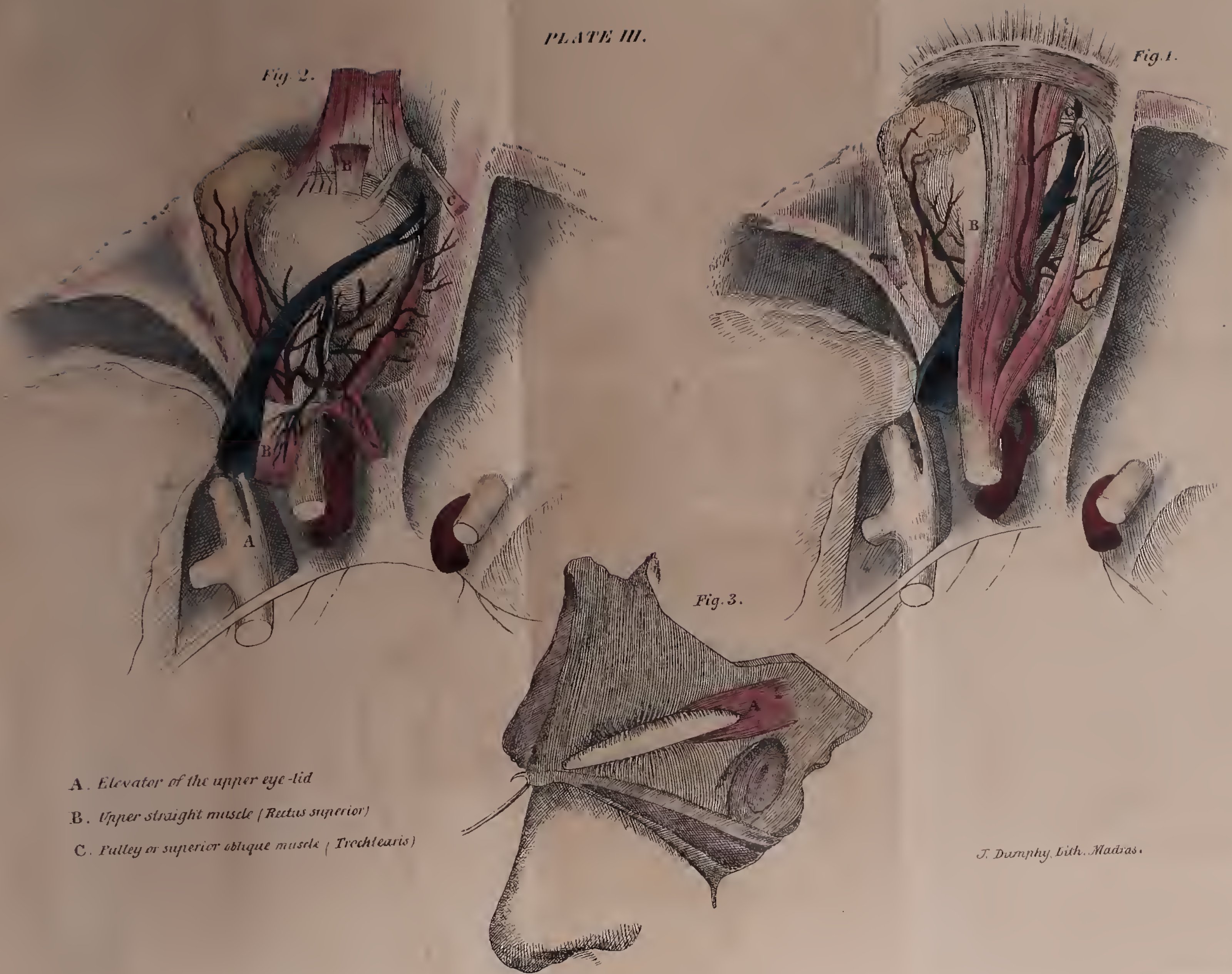
Fig 2. Right Eye shewing a right hand view of the same, more especially **E** *the outer straight muscle.*



e Superior oblique or Pulley.
N *Upper straight muscle.*
E *Outer straight muscle*
S *Lower straight muscle.*
m Inferior oblique.
n Optic nerve, rather to the inner side.

Note. It will be perceived, that for the sake of rendering the subject more intelligible to the general reader, I have marked the muscles more commonly divided as **E** *and* **W** *in the right eye, which of course must be reversed when speaking of the same muscles in the left.*

PLATE III.



A. *Elevator of the upper eye-lid*

B. *Upper straight muscle (Rectus superior)*

C. *Pulley or superior oblique muscle (Trochlearis)*

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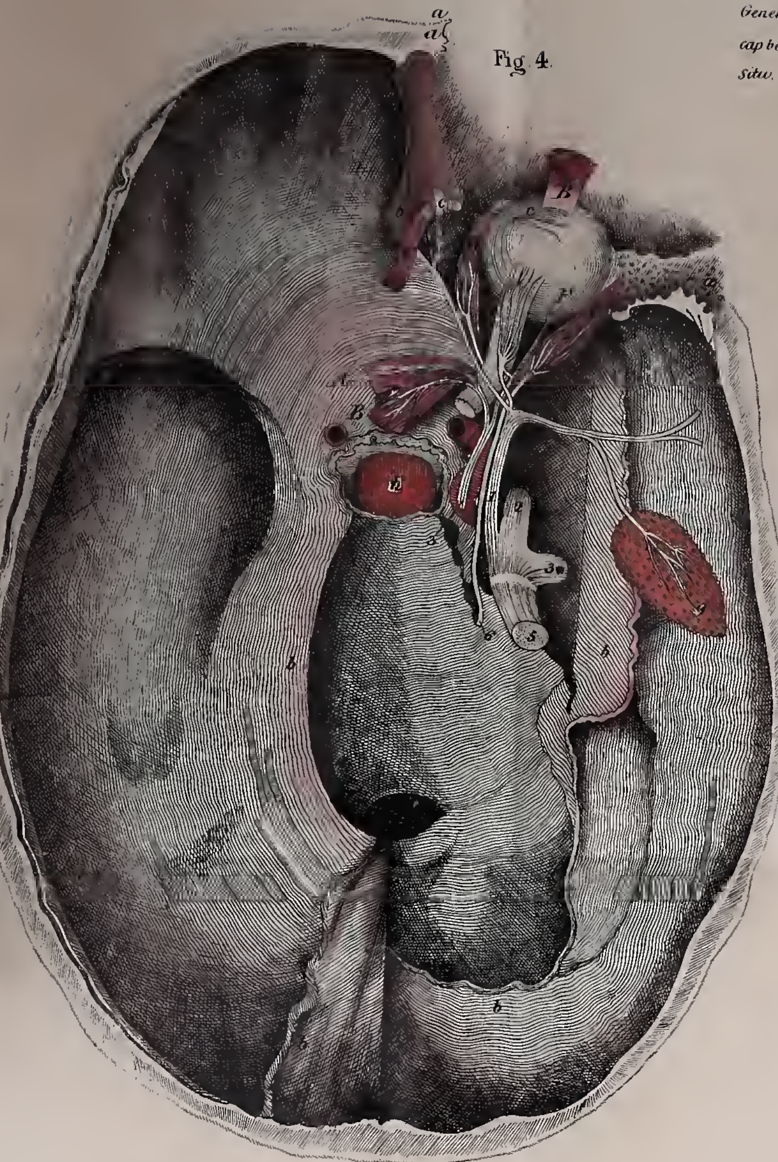
PLATE. IV.

Fig. 4.

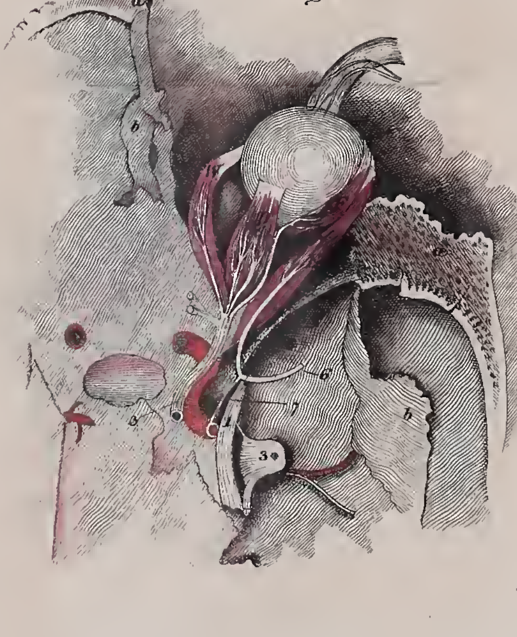


General view of the base of the skull and Orbit, the Skull-cap being removed, shewing a third dissection of the eye in Situ.

- *A Elevator of the upper eye-lid*
- *B. Upper straight muscle (Rectus Sup^{r})*
- *C. Sup^{r} Oblique, or pulley (Trochlearis)*
- *E. Outer straight muscle*
- *W. Inner straight muscle*
- *a. Frontal bone*
- *b. Membranes supporting the brain.*
- *g Lachrymal gland, whence the tears are secreted, removed from its seat over E. the outer muscle of the eye..*
- *h. Pituitary gland (supposed of old, to be the seat of the Soul)*
- *1. The Opthalmic branch of the 5p^{r} of nerves (5.)*
- *2. The Sup^{r} Maxillary branch, (upper Jaw.)*
- *3* The Inf^{r} Maxillary branch, (lower Jaw.)*
- *3. Third p^{r} of nerves, supplying F and W. two of its muscles, seen in this plate, also A and B**
- *6. Sixth p^{r} of nerves, supplying the outer straight muscle only.*

** By which we perceive that the 3rd pair of nerves supply not only three of the straight muscles, but also the Elevator of the upper eye-lid, and the Inferior Oblique.*

Fig. 5.



Anterior view of the base of the skull, and Orbit, shewing a further dissection of the eye: in which, the Optic nerve and ball are turned upwards, so as to shew more particularly the nervous twigs going to supply the lower straight, and inferior oblique muscles.

- *D. lower straight muscle (Rectus Inf^{r})*
- *E. Outer straight muscle (R. Externus)*
- *W. inner straight muscle (R. Internus)*
- *F. inferior oblique (obliquus Inferior)*
- *a. Frontal, or bone of the forehead*
- *b. Membranes supporting the brain*
- *1 Opthalmic branch of the 5th p^{r} of nerves (5)*
- *3* Infe^{r} Maxillary, or 3rd division of the same*
- *3. Third p^{r} of nerves, supplying the muscles D W F.*
- *6. Sixth p^{r} of nerves supplying only E the outer straight muscle, and giving off.*
- *7. A twig going to form with a branch from the opthalmic, and Vidian, the origen (Old style) of the great sympathetic nerve of the body.*

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PLATE, V.

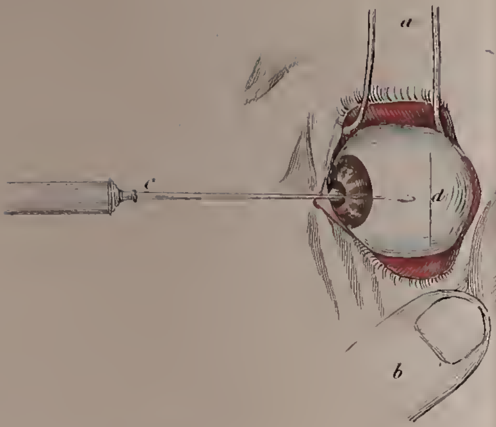


Fig 1.

a. Wire Speculum : supporting the upper lid.
b. Assistants finger depressing the lower lid.
c. Small sharp hook used for rotating and keeping the eye turned outwards.
d. Indicates where, and the extent to which the Conjunctiva is divided.

Fig. 2.

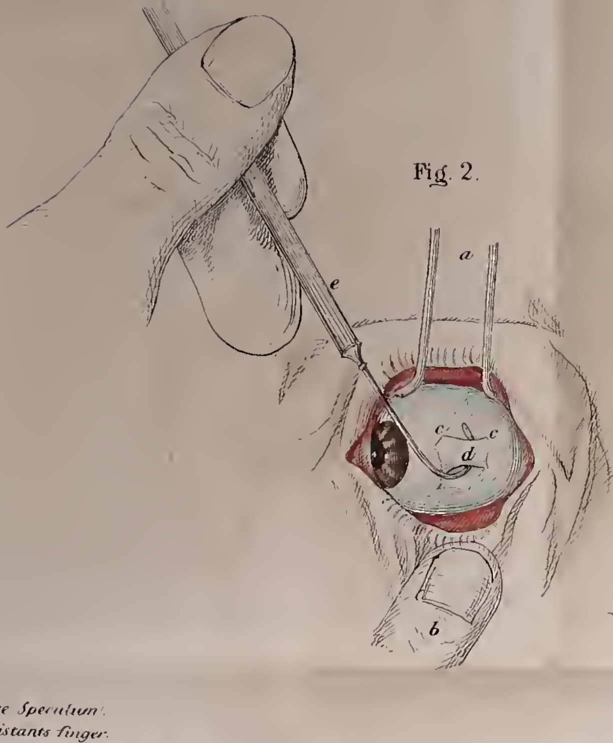


Fig. 2 a. Wire Speculum.
b. Assistants finger.
c. Seperated edges of the cut Conjunctiva, shewing,
d. The tendon drawn up slightly through it. and the Sclerotic underneath.
e. Blunt hook seen passed completely under the tendon, and gently lifting it from off the Sclerotica so as to allow of a blade of the Scissors being in like manner passed under, and to divide the tendon neatly and cleanly. not admitting of an after doubt as to whether or not, it had been completely divided.

It is not considered necessary to shew here how the tendon thus raised should be divided, as that speaks for itself_ besides, it is plainly enough shewn in Mr. F H Bretts Lithograph, as in fact are the few steps of the operation itself The present being intended more to shew the similarity of the instruments used and mode of conducting the Operation than with an Idea of rendering clearer that which Mr. Brett has already so fully demonstrated. The nominal difference being that he uses a curved probe in lieu of a blunt-hook ; and a double. instead of a single toothed sharp hook.

The small sharp hook Fig. 1. may be withdrawn as soon as the blunt-hook is well under and in possession of the tendon as seen Fig. 2.

Snipping the upper eye-lid with the Scissors, or pushing out the Sharp hook with the blunt one. can only occur as an accident, from inattention either on the part of the Operator himself, or of his assistants.

J. Dumphy Lith; Madras.

PLATE VI.

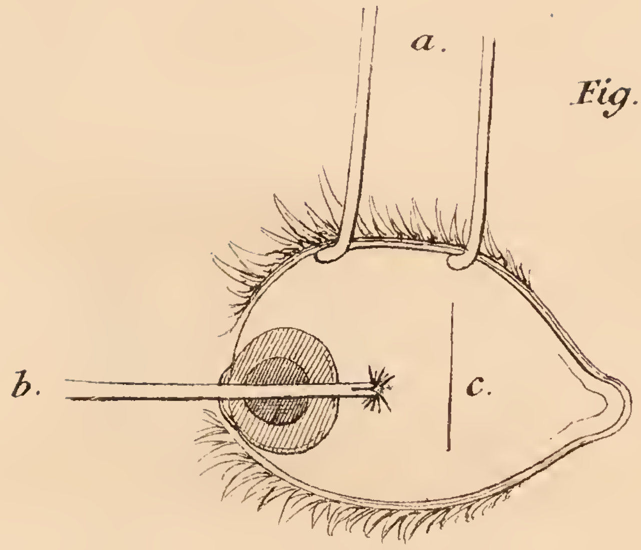


Fig. 1.

a. Speculum.

b. Double sharp hook.

c Line of incision in the conjunctiva.

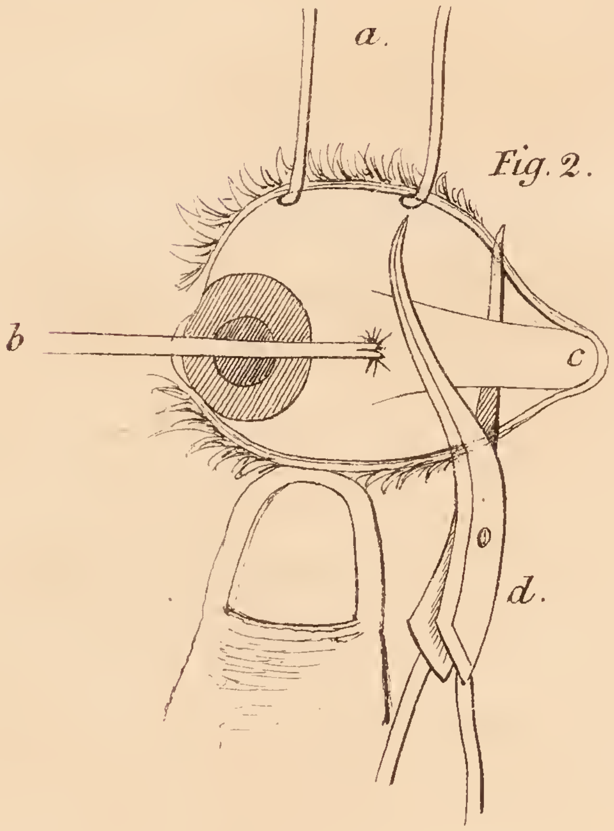


Fig. 2.

a. Speculum

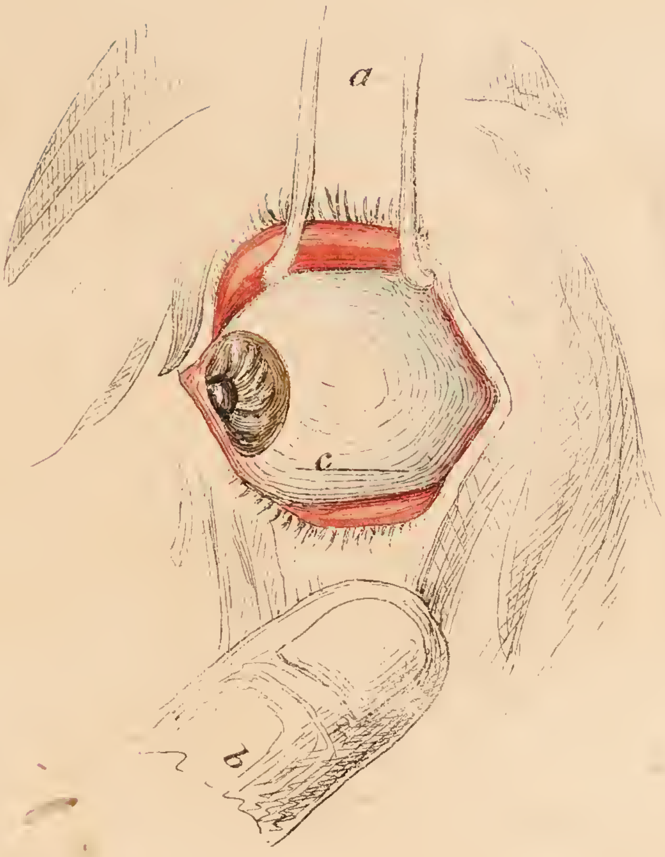
b. Double sharp hook

c. Tendon of the muscle

d. Scissors, shewing the manner in which the
blade is passed underneath.

J. Dumphy, Lith. Madras

PLATE VII.



The operation by the horizontal incision, as practised by D. Ross Leitch, Esqr. of Teignmouth, Northumberland, and which I pursued in my first operation,

a. Wire speculum.
b. Assistants finger.
c. Horizontal incision.

J. Dumphy Lith, Madras

21